PIAAC AND ITS MEANING IN ESTONIA

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Estonia did not participate in IALS and ALL and thus, PIAAC (Programme for the International Assessment of Adult Competencies) has offered us a first chance to get an internationally comparable picture of adults' information processing skills. However, as there was nothing extremely shocking in the results for Estonia, and as the survey was less known among the wider audience than PISA (the results of which have been comparatively good and improving since 2006), PIAAC attracted little media attention. This, and the fact that the detailed data analysis based to be published in 2014-2015 takes time mean that most of the real meaning of the results for policy, practice and future research is still to be seen.

To underline the meaning and get the maximum benefit from Estonian participation in PIAAC, we have added some follow-up activities to the programme "PIAAC-Estonia" - a series of policy-oriented research papers. In this overview, I will describe the papers briefly. I will also give a brief picture of one of three PIAAC results-based main messages that have generated the most discussion so far and are represented in the recently adopted national Lifelong Learning Strategy 2020 (HTM 2014).

1. Programme of policy oriented research papers

PIAAC is an expensive project for all the participating countries but certainly for Estonia – one of the smallest PIAAC countries. The target of collecting a minimum of 5000 responses was a difficult task compared to the samples of a few thousand in most other nationally representative studies. Due to the fact that we decided to conduct the study in two languages – Estonian and Russian that is mother tongue for almost 30% of Estonian population, the final target number of respondents increased to 7500. Altogether, it meant that starting with the sample of 13000 people PIAAC was the largest-ever household survey conducted by Statistics Estonia. When calculating the costs for this, we did not dare to think about anything additional besides data collection. Only during the process, we realized that if we were to do nothing but collect the data, the project would become much more expensive, all in all.

Due to the support from the European Commission in covering the country contributions to OECD, we were able to save some money for what could be called "Estonian programme of policy oriented PIAAC research papers".

In line with most countries, the Estonian national report of initial PIAAC results was published on October 8th 2013. In 2014-2015, we envisage publishing 7 additional thematic reports together with policy recommendations. The topics were chosen by the Estonian PIAAC Council – a body of representatives from 3 ministries, 2 universities, and bodies representing adult and vocational education.

The topics for these reports are:

1) Skills and labour market outcomes, including skills needed for entrepreneurship

This is a somewhat obvious topic in the PIAAC context, but besides salary and employment information from PIAAC study, the results are enriched by register information (In this case specifically Tax Office and Estonian Unemployment Insurance Fund)[1] regarding income and employment periods since 2009. We also had some country-specific questions in the background questionnaire regarding skills and knowledge required for becoming entrepreneur that are to be addressed in the report.

2) Skills and lifelong learning

This report stresses the crucial role of demand-side (characteristics of employer and job) in the field of lifelong learning and refers to the most important target groups of LLL programmes such as blue-collar workers, unemployed, employees from small companies, older age groups and mothers with small children.

3) Low and high performers

On one hand, most earlier studies on adult skills have stressed the relevance of improvement of skills of the low-performing adults. On the other hand, the results of both PISA and PIAAC address the issue of a small share of top-performers in Estonia. What are the causes and consequences of belonging to the top or bottom is the question at the heart of this report.

4) Skills explaining wage gaps

Estonia has struggled with mysteriously high gender wage-gap. In addition, ethnic wage-gap is often talked about as it influences about one third of the Estonian population. Can differences in skills help to explain it? PIAAC gives us the first opportunity to answer this question.

5) ICT skills and ICT use

ICT is at the top of the agenda in Estonia and due to the low scores in problem solving in technology-rich environments (PS-TRE), PIAAC initiated lot of discussion. What did the PS-TRE measure: problem solving or ICT skills? Is the measurement correct? Why did so high a proportion of people opt out of computer-based assessment? Why are the scores decreasing already among 35+ age groups? Are our ICT success stories limited? Is one of the world's best e-government services so easy that people do not learn problem-solving in paying taxes, applying for different subsidies, making bank transfers etc via internet?

6) Skills mismatch

The initial PIAAC national report suggested that the Estonian problem may not be lack of skills but rather limited skills use. Every fourth person with higher education does not need this qualification, and skills deteriorate. When recent graduates have above average skills, then those who graduated 10-15 years ago already have much lower skills. At the same time, employers complain that there is lack of good graduates with vocational education. Should we not develop general skills but rather send more students earlier to vocational track? The Estonian liberal job market has not supported narrow choices until now and everybody knows that the future in respect of professions is not clear.

[1] Together with Nordic countries (Finland, Sweden, Norway and Denmark) we connected PIAAC data with data from 7 registers in order to add longitudinal view and to specify some information. The data was retrieved from registers like Tax Office, Estonian Unemployment Insurance Fund, Estonian Information System of Education, Social Insurance Office, Register of Vocational Qualifications, Population Register, and Estonia Health Insurance Fund.

7) Skills and formal education

PIAAC is certainly not excellent but is currently the best source we have to say anything about the quality of graduates in different fields and at different levels of education. If qualification matters so much more on the job market than information-processing skills (as it is the case in Estonia) then what about the drop-outs? To enrich the analyses, PIAAC data is related to the Estonian Educational Information System where information about upper secondary school graduation exams, language of tuition at school and other information is kept.

Each report includes policy recommendations that are discussed in expert seminars. The first two reports are almost ready. All reports will be finished by spring 2015 when a final PIAAC conference is planned.

As noted above, PIAAC results have been used in refining the Estonian Lifelong Learning Strategy that was adopted in February 2014. The Lifelong Learning Strategy plans activities in 5 strands and most of these are more or less related to PIAAC. The strands are:

- A change in the approach to learning
- Competent and motivated teachers and school leadership
- The concordance of lifelong learning opportunities with the needs of the labour market
- A digital focus in lifelong learning
- Equal opportunities and increased participation in lifelong learning.

A special analysis focusing on teachers' skills that contributed to the strand of competent and motivated teachers and school principals was run based on the PIAAC data. PIAAC also raised the issue of the concordance of learning and labour market needs from a new angle, namely showing that Estonian adults use less skills at work than they have on average. This pointed to the need for work-place innovation. Unexpectedly low results in PS-TRE stressed the relevance of ICT-based learning and ICT skills, a topic that had got somewhat lost in the shadow of the success story of e-Estonia. PIAAC also referred to most vulnerable target groups with respect to lifelong learning participation. Below, I will introduce in more detail the analyses of teachers' information processing skills and computer use in the context of Estonian LLL strategy.

2. Skills of teachers and teacher-training graduates

"Teachers matter" was the title of an OECD (2005) review about school teachers preparation, recruitment, work and careers based on a study on teacher policy in 25 countries. This review states that besides differences in students' skills and motivation, the most important variable that influences student achievement is "teacher quality" – a variable that besides qualifications, teaching experience, and indicators of academic ability or subject-matter knowledge, includes characteristics such as "the ability to convey ideas in clear and convincing ways; to create effective learning environments for different types of students; to foster productive teacher-student relationships; to be enthusiastic and creative; and to work effectively with colleagues and parents." (OECD 2005: 3).

Maintaining and increasing teacher quality, attracting new teachers to schools and good graduates from upper secondary education to teacher training have been a challenge for Estonia for more than a decade. Many people complain that teachers' profession does not have the same

prestige as it used to have in past centuries. Rapid changes in society in the last 25 years have had their impact on schools and many teachers feel confused by the increasing individualization and openness in society, where children know and use their rights, inequality and social problems different from those in the past, constant reforms in education etc. This is stated as one of the main challenges that Lifelong Learning Strategy will tackle during the next 7 years. Another related problem is "teachers' access to the digital infrastructure and learning materials that is limited and inconsistent" (HTM 2014). In the middle of the 1990s, Estonia put through a reform of schools digitization called Tiger Leap[2]. It was a very innovative and powerful reform at that time, still mentioned as a good example of that kind of initiative. However, for some past 5 to 10 years, both politicians and educational specialists speak about a sleeping tiger: outdating of technology, lack of teacher ICT skills and learning materials to offer attractive learning opportunities for the new generation of digital natives. Estonian students are very frequent computer users but the usage is often limited to social media and gaming since technology is not used enough in schools.

Given this context, we were very interested in teachers' PS-TRE and it appeared that this interest was not solely ours. On November 21st, 2013, Andreas Schleicher posted a blog entry to OECD's blog educationtoday[3] entitled "*What teachers know and how that compares with college graduates around the world*". In this post, all teaching professionals ranging from teachers of hobby classes and kindergartens (in case of some countries) to university teachers were included under the common denominator 'teachers' leading to a rather mixed picture to make sense of the information. The share of university teachers among teaching professionals varies for example from 3-18% and the share of kindergarten teachers from 2-27% in different countries.

Thus, we undertook the analyses on a somewhat narrower group. In the analyses presented below, only primary and secondary education teachers[4] are included that on average across PIAAC samples account for 56% of the teaching professionals. Only countries which public use files included 4 digit level information about occupations were selected. There were 2052 teachers from 16 countries included in the analyses, ranging from 68 to 316 teachers per country (see table 1). Depending on a country, 40-70% of teachers got their higher education in the field of teacher training or educational science. Although this is a random selection, there is no reason to believe that these are representative samples of teachers in the respective countries. However, in the case of Estonia, the group is rather similar to the entire teachers' population in respect to age, gender and educational composition, as well as the more narrowly defined occupational structure. It will be shown later that their average salary also corresponds to the national average of entire teachers' population.

In most of the countries (excluding 2-3 countries at both ends of the ranking) teachers' literacy scores are rather similar ranging between 290-300 points (see Figure 1). Only in Italy, Russia and Denmark, teachers' literacy scores were below and only in the Netherlands and Japan above the average of the 16 countries. In all countries except Russia, teachers outperformed other employed people by 19 points on average (in both literacy and numeracy). Estonian teachers were at the average in both literacy and numeracy compared to the teachers from the other countries, and the difference from other employed people in Estonia was rather small (not shown in the figure). Thus,

[2] Tiger Leap http://en.wikipedia.org/wiki/Tiigrih%C3%BCpe

[3] http://oecdeducationtoday.blogspot.com/2013/11/what-teachers-know-and-how-that.html?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+EducationtodayBlog+%28educationtoday+blog%29

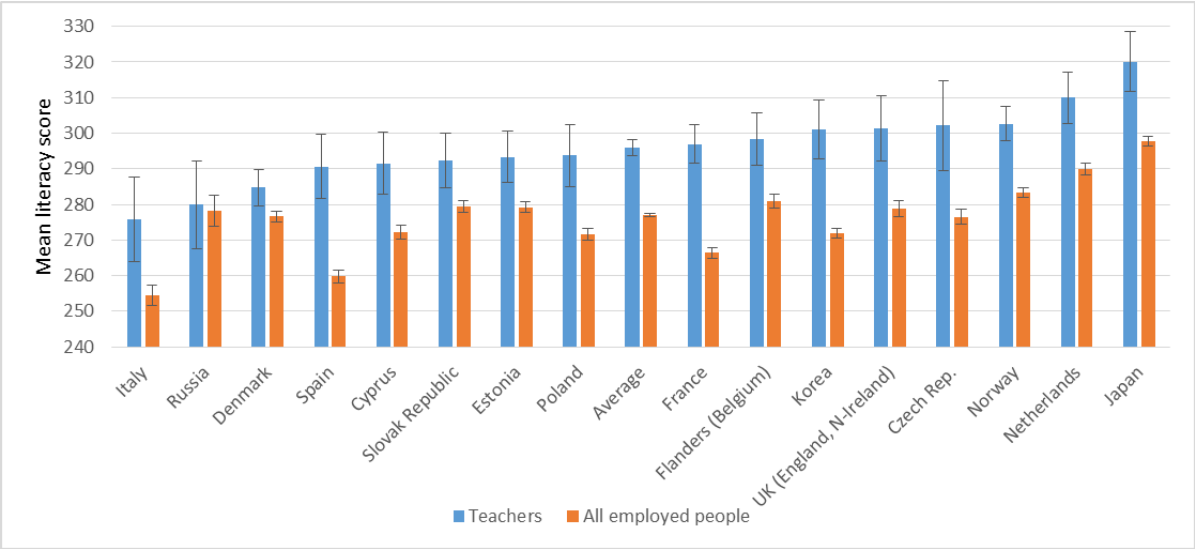
[4] Norway and UK did not differentiate between primary school and early childhood teachers and they are all included in the analyses.

in a national context, the Estonian teachers are less outstanding than teachers e.g. in Spain, France, Korea or Czech Republic.

Table 1. Primary and secondary school teachers in PIAAC database

Country	No of teachers	No of teaching professionals	Proportion of female teachers	Mean age of teachers
Flanders (Belgium)	132	245	66,2%	42,4
Czech Republic	85	151	65,5%	42,4
Cyprus	109	197	67,5%	40,3
Denmark	316	497	73,8%	43,6
Estonia	132	287	91,6%	43,3
France	142	198	66,3%	41,9
Italy	91	156	77,1%	45,9
Japan	68	133	49,4%	44,7
Korea	79	184	67,0%	40,4
Netherlands	97	203	70,7%	41,8
Norway	232	327	74,8%	41,9
Poland	127	228	87,4%	41,8
Russian Federation	84	181	89,4%	41,5
Slovak Republic	80	163	83,2%	42,8
Spain	83	193	56,6%	44,2
United Kingdom (England and Northern Ireland)	195	328	70,3%	40,8
Altogether	2052	3671	72,3%	42,5

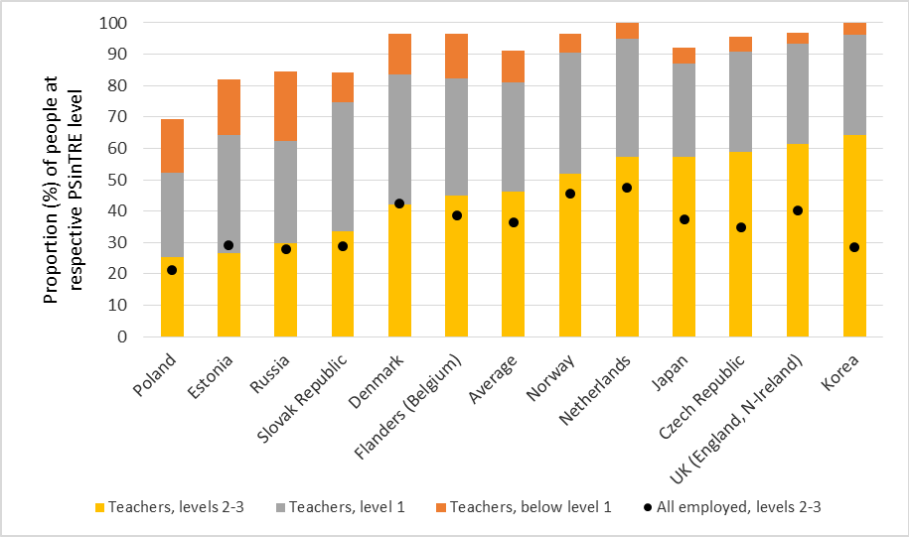
Figure 1. Average literacy scores with 95% confidence intervals for teachers and all employed people



Note: Countries are ranked by teachers' mean score.

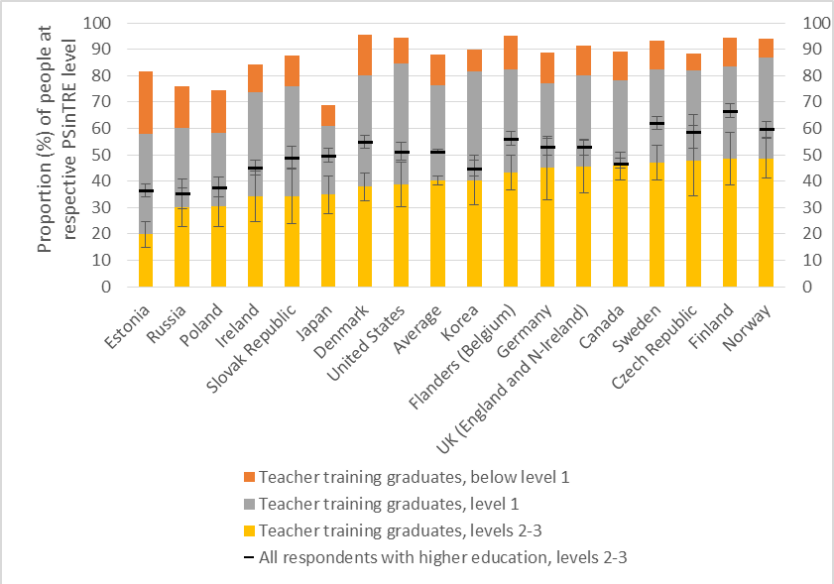
Our focus of interest was on problem solving in technology-rich environment. Are our teachers ready for a new Tiger Leap in schools envisaged in the LLL strategy? The results presented in Figure 2 show that only about a quarter (27%) of Estonian teachers have good skills in PS-TRE (scoring at the proficiency levels 2 or 3) that is significantly below the average of the selected 16 countries (46%). The picture is even worse in case of higher education graduates in the field of teacher training (Figure 3). The proportion of high-skilled in PS-TRE (levels 2-3) was lower among teacher training graduates than higher education graduates in general in Estonia and in about half of the other countries. In international comparison, Estonian teacher training graduates scored the lowest.

Figure 2. Proportion of teachers at different levels of problem solving in technology-rich environment, for comparison the proportion of all employed respondents at levels 2 and 3 is presented



Note: Countries are ranked by the share of teachers at levels 2 and 3. The difference from 100% refers to the respondents who did not solve tasks on computer.

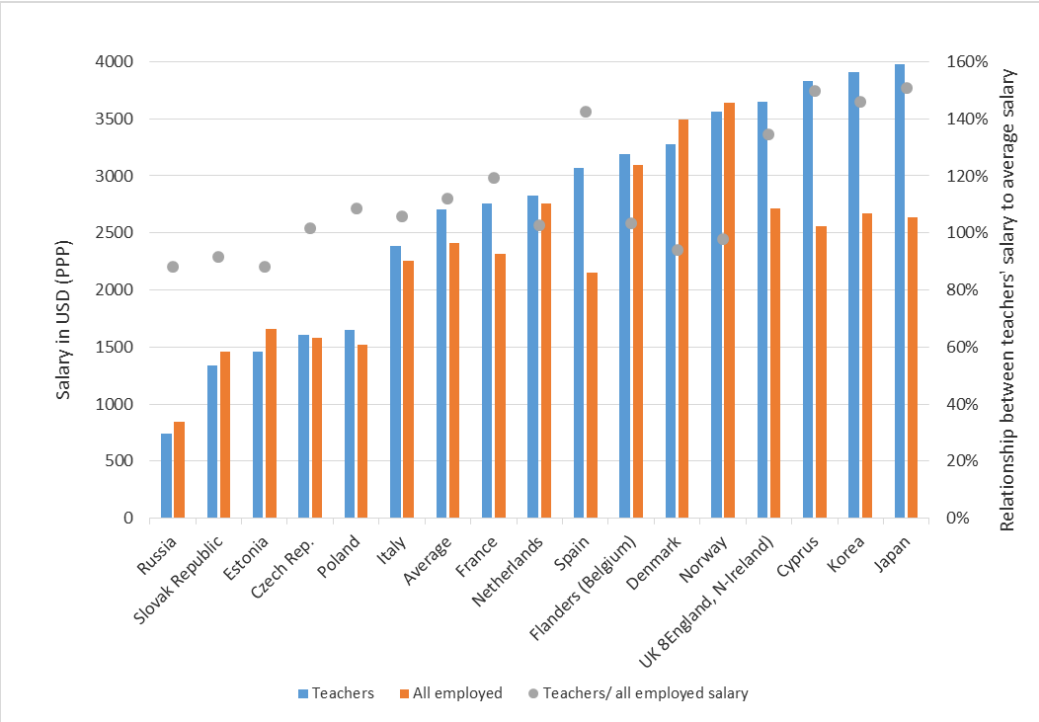
Figure 3. Proportion of higher education graduates in the field of teacher training at different levels of problem solving in technology-rich environment, for comparison the proportion of all higher education graduates at levels 2 and 3 is presented



Note: Countries are ranked by the share of teacher training graduates at levels 2 and 3. The difference from 100% refers to the respondents who did not solve tasks on computer. The number of teacher training graduates ranges between 150-300, except for Italy where there were only 32. Because of the very small sample, Italy was excluded from the analysis.

One aim of the Estonian LLL strategy is to increase the attractiveness of teachers' profession in Estonia. To achieve this, teachers' salary has to increase in addition to other measures. As shown in Figure 4 there is a clear need for that. In most of the selected countries teachers' skills on average exceed the average skills of all employed people (excluding some countries in PS-TRE and Russia in case of all skills), in case of salary, this holds true for about half of the countries. Across all of the selected countries, teachers earn on average 12% higher salary than average employees. In Estonia, however, teachers earned less than average.

Figure 4. Salary of teachers' and all employed people in PIAAC in USD (PPP)

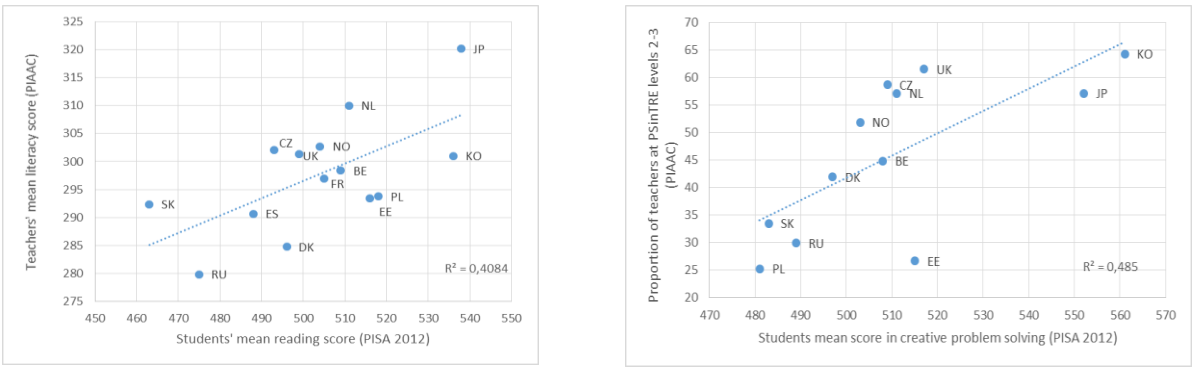


Note: Countries are ranked by teachers' salary

Since PISA scores for pupils have been quite good and improving during the last 6 years in Estonia, it is difficult to interpret and explain teachers' scores. Do teachers' information processing skills matter for pupils' respective skills or do specifically PS-TRE skills matter for adopting technology at schools?

The statement that teachers matter was tested correlating teachers' literacy skills in PIAAC and students' reading scores in PISA 2012 across countries (OECD 2013). The relationship seems to be quite strong (R^2=,41): students' scores are better in the countries where teachers have better literacy skills and vice versa. The same is valid for problem solving: students' scores in creative problem solving (OECD 2014) and teachers' scores in PS-TRE are related (R^2=,48). See Figures 5 and 6. Of course, it is impossible to ascribe a causal relationship from this pattern: there are most probably several factors influencing both teachers' and students' scores. However, it is interesting to see that the proportion of teachers with good PS-TRE scores (levels 2 and 3) is almost not related to students' literacy scores (not shown in figure)

Figures 5-6. Teachers' and students' literacy and problem solving skills in PIAAC and PISA 2012

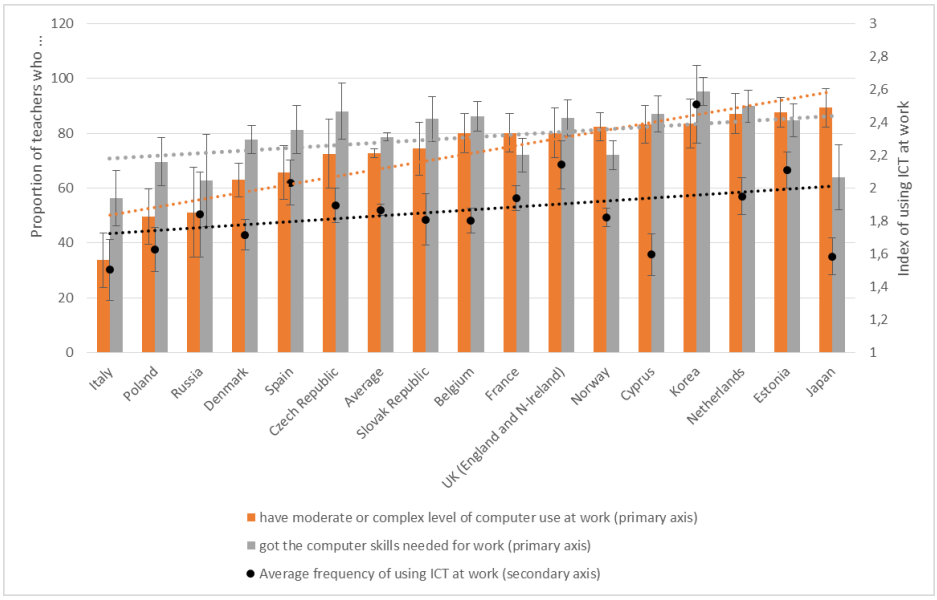


Note: OECD mean score in reading in PISA 2012 was 496 and in creative problem solving 500. PIAAC scores range from 0-500 with literacy mean score around 270.

Finally, PIAAC enables us to analyse whether and how frequently teachers use ICT skills at work, what is the level of computer-use required for their job and whether they perceive that they have necessary computer skills for their work.

In 13 out of the 16 countries, over 89% of teachers use computer at work. The proportion is smaller in Italy (66%), Russia (71%) and Poland (81%). Almost every (98-100%) teacher uses computer at work in Japan, Korea, Norway, Estonia and the Netherlands. The same countries are also on top of teachers' perception of the complexity of computer-use at work. Almost 90% of teachers in these countries claim that their work requires a moderate or complex level of computer-use, while in Italy, Poland and Russia 50% or less think so. Korean and Estonian, and British and Spanish teachers use computers and Internet more frequently than teachers in the 16 countries on average and there are more teachers in Korea, the Netherlands, Estonia (and UK, Belgium and Cyprus) than on average who think they have the necessary computer skills. In respect to computer use, one could conclude that Estonian teachers do it very often and think that they manage it quite well.

Figure 7. Teachers' self-reported computer-use level at work, satisfaction with the skills needed for work and frequency of using ICT at work.



Note: Index of using ICT at work is calculated based on the frequency of using seven computer or Internet-based activities. The mean score across all respondents is 2 and SD=1.

Summary

The paper pointed to some controversial results regarding Estonian teachers' skills.

- Estonian 15-year-old students are doing very well in PISA. The good results are achieved despite the fact that:
  - Compared to the other countries Estonian teachers have average literacy and numeracy and very low PS-TRE skills.
  - Estonian teachers' salary compared to the national average is lower than in most other countries and this is reflected in the fact that teacher training field in higher education is not attractive for the best upper secondary education graduates.
- Teachers and students skill scores in respective fields (literacy to reading, problem solving in TRE to creative problem solving) seem to be related at a country level.
- 99% of Estonian teachers use computers at work, they use ICT often and more often than on average at moderate or complex level. Estonian teachers are also quite satisfied with their computer skills.

There are no easy conclusions from this somewhat confusing picture. One explanation could be that the teachers' sample does not reflect the real teachers' population. Assuming however that it does, it seems that teacher training should first of all stress on developing problem-solving skills and obviously there is room for increasing teachers' salary to make the profession more popular. Considering the low prestige of the profession and low results also among young teacher training graduates (not shown in this paper) the direction of the LLL strategy seems right. For awakening the tiger and introducing a new digitization agenda at schools, all teachers seem to have some degree of readiness: they use computers and mostly feel confident about their skill. However, there still remains a lack of high level PS-TRE skills.

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