

E-Skills of Prospective Teachers

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Abstract

Digital skills are an integral part of the teachers' qualification. The fourth annual European campaign e-Skills for Jobs 2015 initiated by the Directorate General for Enterprise and Industry of the European Commission and took place in 2015. As a part of the campaign, the IT Fitness Test 2015 took place in both Czech and Slovak Republic. It is an online test of digital knowledge and skills (e-Skills) that was designed primarily for self-evaluation of public participants. The test was designed and coordinated by the Slovak IT Association under the auspices of the Department of Informatics Education, FMFI, Comenius University in Bratislava in the Slovak Republic. In parallel to that, in the Czech Republic it was coordinated by The Centre for International Cooperation in Education under the auspices of the Ministry of Education, Youth and Sports. Hence, in 2015 it was made available in two languages – Slovak and Czech. Beyond the scope of the campaign, the IT Fitness Test in 2015 was specifically used to survey e-skills of students of the teacher training study programmes at three faculties of education – Jan Evangelista Purkyně University in Ústí nad Labem and Technical University in Liberec, both in the Czech Republic, and Comenius University in Bratislava, the Slovak Republic. The main focus is e-skills of prospective special and social educators. The paper describes the methodology and results of testing achieved by students. Student performances are compared to each other as well as to the results of the last year's IT Fitness Test 2014.

Introduction

Knowledge and skills in *digital technologies* (DT, in the same sense is used for the term Information and Communication Technology, ICT) belong to the important skills of people in the modern information society. In the Czech Republic, these competencies are not included among the so-called *core competencies* namely stated in the *Framework education programs*, nor at the primary, nor the secondary school level.

However, DT affects many areas of human activities. Knowledge and skills in DT seem to be necessary for both the labour market and for a sense of self-fulfillment in private lives. The trend is clear—school-leavers living in an information society that is full of digital technologies will not be able to participate fully in society without mastering them. Although the use of many programs is not difficult, it is necessary to obey certain procedures and rules. Merely intuitive use can lead to mistakes and blunders with far-reaching consequences. Already today we can speak about the so-called digital disadvantage—the individual cannot use the DT at work and in the daily life meaningfully and efficiently. An individual equipped only with “a classic education” (i.e. from pre-ICT era), will not have a chance to fully join the digital world even if his education was the most perfect one.

E-Skills

The full definition of e-skills used within the *e-Skills for Jobs* campaign is relatively broad and covers three categories of e-skills: ICT user skills, e-Skills (ICT practitioner skills) and e-business skills (a hybrid of technology and business skills sets). This definition has been used in the multitude of studies and projects and e-skills carried out by different actors and stakeholders in Europe since then. It has also been referred to and presented in the Tender Specifications of the present call for tender stating that the term “e-skills for competitiveness and innovation” should be used as the overarching term covering three main categories:

- ICT practitioner skills: the capabilities required for researching, developing, designing, strategic planning, managing, producing, consulting, marketing, selling, integrating, installing, administering, maintaining, supporting and servicing ICT systems.
- ICT user skills: the capabilities required for the effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work. User skills cover the use of common software tools and of specialised tools supporting business functions within industry. At the general level, they cover "digital literacy": the skills required for the confident and critical use of ICT for work, leisure, learning and communication.
- e-Leadership skills: these cover a range of skills, attributes and attitudes related to: knowledge of the capabilities and limitations of software systems and information systems in use; ability to quickly assess new capabilities of existing systems and the relevance of offers of software and web services emerging on the market; ability to describe prototype solutions; understanding of the fundamentals of alignment of business and IT functions in an organisation (Gareis 2014).

When surveying the e-skills of prospective teachers by the IT Fitness test, the main focus is the ICT user skills, mainly understood as the capabilities required for the effective application of ICT systems and devices by the individual.

E-Skills for Jobs & IT Fitness Test

IT Fitness Test 2014

In 2014, an on-going campaign *e-Skills for Jobs* had been launched under the European Commission's *Grand Coalition for Digital Jobs*. The main aim of the campaign is to help motivate young people to study and seek career opportunities in the field of ICT. Another goal is to stimulate public interest in increasing their level of IT skills for both ordinary life and professional purposes (DZS 2016). One of the campaign activities is the *IT Fitness Test* by which the public can test their knowledge and skills related to information technology.

IT Fitness Test was carried out online in an interactive way through a web application www.itfitness.cz. There were two different multiple choice tests available. The first one was designed for basic school level (BSL, estimated participant age between 14–16 years) and the second one was intended primarily for high school, or even for those in higher age groups (HAG). Both tests were introduced by descriptive information section. Summary results of the test are given in the IT Fitness Test 2014 Report – Results (DZS 2016).

IT Fitness Test 2014 was used to determine the digital knowledge and skills of students in different branches of the study program Specialization in Pedagogy at Faculty of Education, University of J. E. Purkyne in Usti nad Labem (FEU UJEP), the Czech Republic. It was found that UJEP participants' results in BSL test were comparable with the results of other participants currently studying university, but FEU UJEP participants were significantly worse in the HAG test. It was shown that there are significant differences among college students. Their digital knowledge and skills range almost the whole evaluation scale from students without functional digital skills to students with above-average digital knowledge and skills that can be considered as individuals with functional literacy (Peřat 2015).

IT Fitness Test 2015

In 2015, a structure of the test was such as the one used in 2014. IT Fitness Test 2015 had introductory information section followed by the knowledge and competence test section. There were 25 multiple-choice items divided equally into the following five sections:

- Internet search;
- Internet safety;
- Social networking;
- Office applications;
- Complex tasks.

Each multiple choice test item (question) was randomly generated from four options. Thereby a large number of variants were provided and the test results were practically non-transferable among participants. When designing alternatives, an experience from the IT Fitness Test 2014 was used and four variants of questions were of approximately equal difficulty. Significantly harder items occurred only exceptionally (Kubincová 2015). The estimated time required to complete the whole test has increased to 45-60 minutes. Summary results of the test were given in the IT Fitness Test 2015 Report – Results (DZS 2015).

IT Fitness Test 2015 at prospective teachers

IT Fitness Test 2015 was used to determine the digital knowledge and skills of prospective teachers in different philology branches at FEd UJEP. Two groups of the reference samples to prospective teachers (TT—Teacher Training) were chosen – prospective teachers of non-informatics and informatics branches at the Faculty of Sciences, Humanities and Education, Technical University of Liberec, the Czech Republic (TUL) and students of pedagogical branches providing non-teacher qualification namely in special education (nonTE—nonTeacher Education) at both FEd UJEP and Faculty of Education of the Comenius University in Bratislava, the Slovak Republic (UNIBA).

Both tests (BSL and HAG) were given *as an obligatory homework* to students who enrolled ICT courses at FEd UJEP and TUL in the winter semester 2015/2016. Only the HAG test was given *as an obligatory homework* at UNIBA. A different methodology of participant selection was used at Faculty of Education, Palacky University in Olomouc, the Czech Republic. This group of participants was asked to *participate voluntarily* in testing. However, the return of completed test was only a few percent and it was marginal from the statistical point of view. The results of this group were not sufficient for the correct statistical processing.

The on-line testing application was provided by an external company. Due to the specific properties of the testing application, it was not possible to extract students' results directly from the online recorded results data file. Therefore, students have always copied their test results from the display into the picture (screenshot). Subsequently, they sent an e-mail with the screenshot to the mail address itfitness2015@gmail.com for further processing. In the email subject, the students reported their identification in the form of an exact text string as follows:

E-skills_university
 abbreviation_year of study_branch
 of study_date of
 lecture_name&surname initials.
 Students were instructed to complete the test without any help because one of the objectives of the ICT subject was the practicing and consolidation of digital knowledge and skills. They were informed that they can use test results by themselves as an indicator of their knowledge and skills (self-assessment). The teachers declared not to apply their results in the assessment of their study except verifying that the file with the test results was delivered at all.

An example of student results is shown in Figure 1. When processing the results, it was visually checked that there are no identic numerical combinations of values and that the screenshots vary in fine details, i.e. that students did not forward screenshots with results to one another.

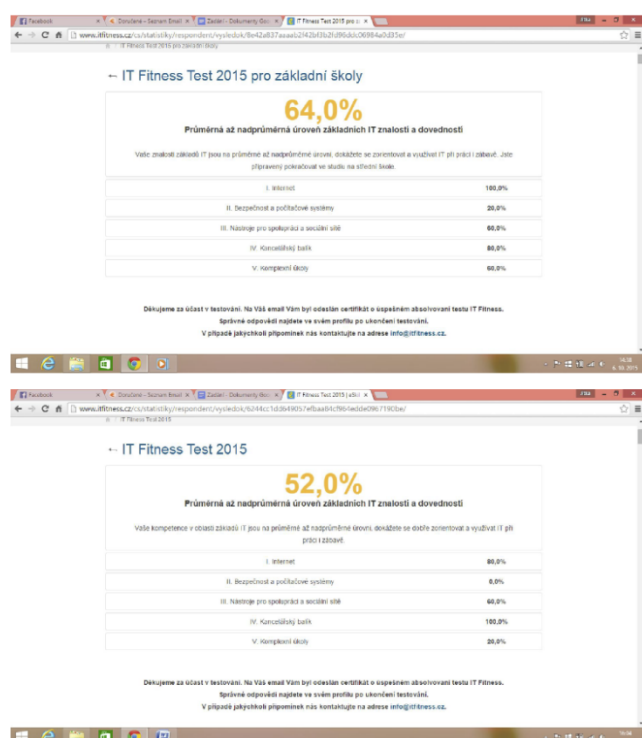


Figure 1 An example of the screenshot with results of the IT Fitness Test 2015 was sent by student to further processing

The test was entered to students as is described above. Results of individual participants were tabulated and basic quantities of descriptive statistics were calculated. The comparable groups of students of the following study programmes were chosen for further processing and analysis:

- A) Philology (UJEP Bc. level, general base within teacher training, year 1 of 3, total 180 ECTS credits, full-time);
- B) Czech Language for Media and Public Sphere (UJEP Bc. level, non-teacher education, year 1 of 3, total 180 ECTS credits, full-time);
- C) Physical Education and Sport (UJEP Bc. level, general base within teacher training, year 1 of 3, total 180 ECTS credits, full-time);
- D) Special pedagogy—intervention (UJEP Bc. level, non-teacher education, year 1 of 3, total 180 ECTS credits, full-time);
- E) Social pedagogy (UJEP Bc. level, non-teacher education, year 1 of 3, total 180 ECTS credits, full-time);
- F) Non-Informatics Prospective Teacher (TUL Bc. level, teacher training, year 1 of 3, total 180 ECTS credits, full-time);
- G) Informatics Prospective Teacher (TUL Bc. level, teacher training, year 1 of 3, total 180 ECTS credits, part-time);
- H) Informatics Prospective Teacher (TUL Master level, teacher training, year 1 of 3, total 120 ECTS credits, full-time);
- I) Special pedagogy (UNIBA Bc. level, non-teacher education, year 1 of 3, total 180 ECTS credits, full-time);
- J) Special pedagogy (UNIBA Master level, non-teacher education, year 1 of 3, total 180 ECTS credits, full-time).

The average score was calculated along with the standard deviation, modus & median of scores and minimum & maximum of scores. The resulting values are given in Table 1.

It was found that in the same group of participants the BSL results of the IT Fitness Test 2015 significantly differ from the HAG results, the average scores in the HAG test are about 10% lower. There are no significant differences in results of both prospective teachers in non-informatics branches (mainly philology) and non-teacher branches (special education) at surveyed groups of students at UJEP, TUL and UNIBA. When comparing students of bachelor's and master's degree, the difference is about the threshold of statistical significance, there is a tendency to better results at the master's students comparing to undergraduate students. It was found that there are students with a significantly different level of digital knowledge and skills in any group. Any respondent was successful at least in one item, the minimum score in the BSL test was 25 % and 16 % in the HAG test respectively. If these results truly reflect the digital knowledge and skills of prospective teachers, these students cannot be considered as teachers with a functional digital literacy. The maximum score of any group in the BSL test was above 80 % and above 76 % in the HAG test respectively (except the physical education group). These students can be considered as individuals with above-average digital knowledge and skills, i.e. individuals proving functional digital literacy.

Participants' knowledge and skills in different areas were examined as well, the results are shown in Table 2 and in Figure 1 for a clear overview. It was found that statistically the best knowledge and skills of students is searching information on the Internet. The worst knowledge and skills of students is the area of internet safety. In other areas the differences are not statistically significant, the complex tasks section shows a tendency to worse scores.

Table 1 IT Fitness Test 2015 – results of prospective teachers and special educators (reference sample)

	IT Fitness Test 2015		Basic School Level (BSL)					
	program of study	sum of particip. [n]	average score [%]	standard deviation [%]	modus [%]	median [%]	min. score [%]	max. score [%]
UJEP	A = Bc. Philology (TT, 1Y, FT)	31	64,4	12,4	60	68	36	84
	B = Bc. Czech Language (nonTE, 1Y, FT)	22	62,9	11,1	60	62	44	84
	C = Bc. Physical Education (TT, 1Y, FT)	12	59,0	15,8	56	56	28	84
	D = Bc. Special pedagogy (nonTE, 1Y, FT)	25	62,2	10,9	56	60	48	84
	E = Bc. Social pedagogy (nonTE, 1Y, FT)	29	59,7	12,7	52	60	32	80
	Teacher Training overall	43	62,9	13,6	60	64	28	84
	nonTeacher Education overall	76	61,5	11,7	60	60	32	84
overall	119	62,0	12,5	60	60	28	84	
TUL	F = Bc. non-Informatics (TT, 1Y, FT)	29	63,4	18,1	60	68	24	96
	G = Bc. Informatics (TT, 1Y, PT)	8	65,3	15,3	76	68	40	84
	H = NMGr. Informatics (TT, 1Y, FT)	5	68,0	7,7	not stated	66	60	80
	overall	42	64,7	15,9	60	68	24	96
	IT Fitness Test 2015		Higher Age Groups HAG					
UJEP	A = Bc. Philology (TT, 1Y, FT)	31	55,4	11,8	48	56	32	84
	B = Bc. Czech Language (nonTE, 1Y, FT)	22	55,6	10,7	60	56	40	76
	C = Bc. Physical Education (TT, 1Y, FT)	12	51,7	11,5	52	54	32	64
	D = Bc. Special pedagogy (nonTE, 1Y, FT)	25	51,0	11,4	48	48	32	80
	E = Bc. Social pedagogy (nonTE, 1Y, FT)	29	52,3	13,4	52	52	16	80
	Teacher Training overall	43	54,3	11,8	56	56	32	84
	nonTeacher Education overall	76	52,8	12,2	48	52	16	80
overall	119	53,4	12,0	56	52	16	84	
TUL	F = Bc. non-Informatics (TT, 1Y, FT)	29	49,2	12,6	44	48	24	76
	G = Bc. Informatics (TT, 1Y, PT)	8	52,0	13,3	44	46	36	76
	H = NMGr. Informatics (TT, 1Y, FT)	5	63,2	7,3	56	64	56	76
	overall	42	51,4	13,0	44	48	24	76
UNIBA	I = Bc. Special pedagogy (nonTE, 1Y, FT)	37	54,4	9,6	52	56	32	76
	J = NMGr. Special pedagogy (nonTE, 1Y, FT)	34	56,4	14,3	52	56	16	76
	overall	99	55,6	13,1	52	56	16	84

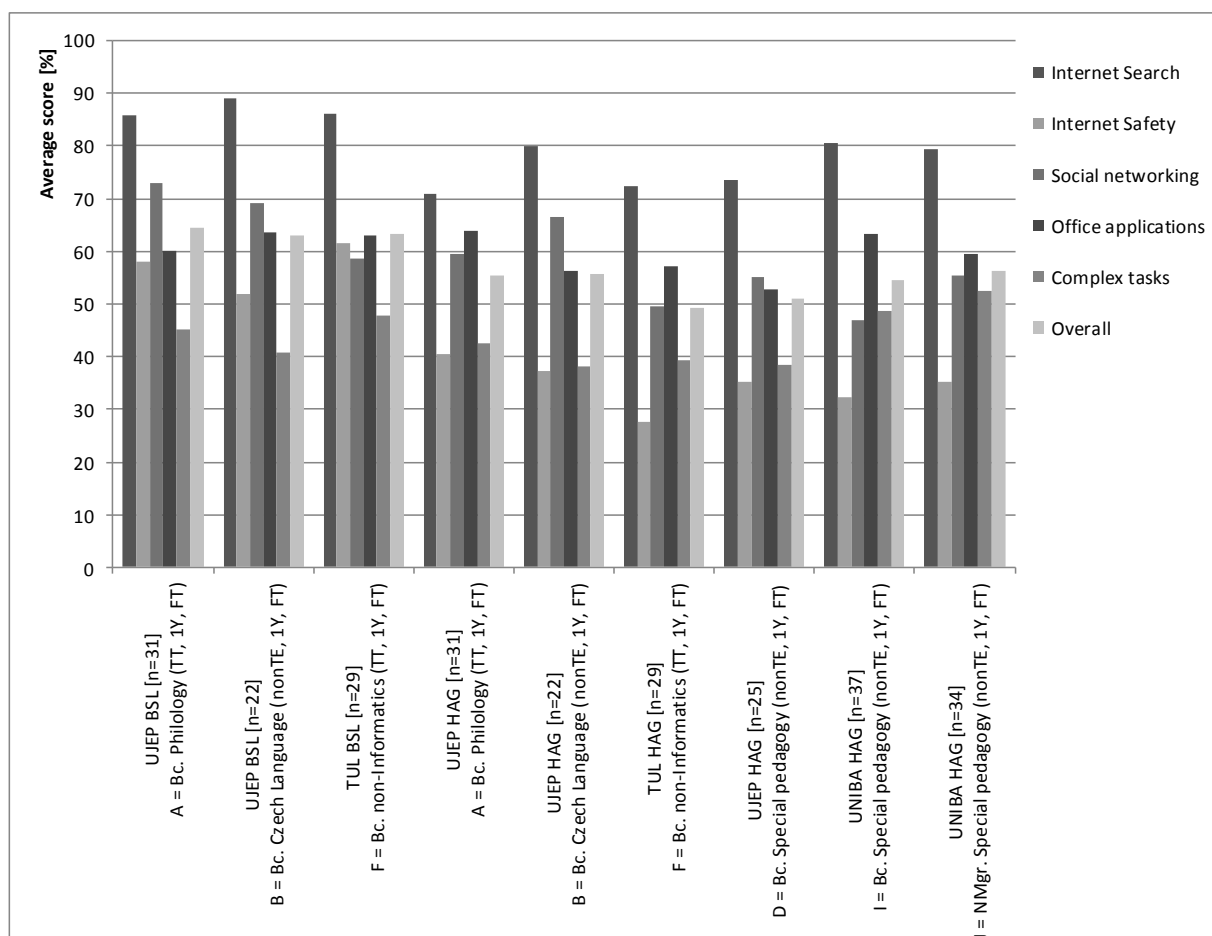


Figure 2 IT Fitness Test 2015 – relative scores in test sections

Table 2 IT Fitness Test 2015 – results of prospective teachers and special educators

	IT Fitness Test 2015		BSL: A = Bc. Philology (TT, 1Y, FT)						
	section	sum of particip. [n]	average score [%]	standard deviation [%]	modus [%]	median [%]	min. score [%]	max. score [%]	
UJEP	Internet Search	31	85,8	16,2	80	80	40	100	
	Internet Safety		58,1	25,1	60	60	20	100	
	Social networking		72,9	21,3	60	80	40	100	
	Office applications		60,0	22,7	60	60	20	100	
	Complex tasks		45,2	26,9	40	40	0	100	
	Overall	31	64,4	12,4	60	68	36	84	
	BSL: B = Bc. Czech Language (nonTE, 1Y, FT)								
	Internet Search	22	89,1	10,0	80	80	80	100	
	Internet Safety		51,8	25,3	60	60	0	100	
	Social networking		69,1	26,1	60	70	0	100	
	Office applications		63,6	16,7	60	60	40	100	
	Complex tasks		40,9	20,4	60	40	0	80	
	Overall	22	62,9	11,1	60	62	44	84	
	HAG: A = Bc. Philology (TT, 1Y, FT)								
	Internet Search	31	71,0	22,6	80	80	20	100	
	Internet Safety		40,6	22,4	40	40	0	80	
	Social networking		59,4	22,4	80	60	20	100	
	Office applications		63,9	19,3	60	60	40	100	
	Complex tasks		42,6	25,3	20	40	0	100	
	Overall	31	55,4	11,8	48	56	32	84	
HAG: B = Bc. Czech Language (nonTE, 1Y, FT)									
Internet Search	22	80,0	19,1	80	80	40	100		
Internet Safety		37,3	27,2	20	40	0	80		
Social networking		66,4	25,1	80	80	0	100		
Office applications		56,4	18,7	60	60	20	100		
Complex tasks		38,2	19,0	40	40	0	80		
Overall	22	55,6	10,7	60	56	40	76		
HAG: D = Bc. Special pedagogy (nonTE, 1Y, FT)									
Internet Search	25	73,6	21,0	60	80	40	100		
Internet Safety		35,2	17,2	40	40	0	60		
Social networking		55,2	21,4	40	60	20	100		
Office applications		52,8	16,9	60	60	20	100		
Complex tasks		38,4	21,9	40	40	0	80		
Overall	25	51,0	11,4	48	48	32	80		
TUL	BSL: F = Bc. non-Informatics (TT, 1Y, FT)								
	Internet Search	29	86,2	21,8	100	100	20	100	
	Internet Safety		61,5	25,9	80	80	20	100	
	Social networking		58,5	30,5	20	60	20	100	
	Office applications		63,1	22,5	80	60	20	100	
	Complex tasks		47,7	27,3	60	60	0	100	
	Overall	29	63,4	18,1	60	68	24	96	
	HAG: F = Bc. non-Informatics (TT, 1Y, FT)								
	Internet Search	29	72,4	17,7	80	80	40	100	
	Internet Safety		27,6	19,2	20	20	0	60	
Social networking	49,7		25,0	40	40	0	100		
Office applications	57,2		21,5	60	60	0	100		
Complex tasks	39,3		19,3	40	40	0	80		
Overall	29	49,2	12,6	44	48	24	76		
UNIBA	HAG: I = Bc. Special pedagogy (nonTE, 1Y, FT)								
	Internet Search	37	80,5	15,8	80	80	40	100	
	Internet Safety		32,4	22,0	40	40	0	80	
	Social networking		47,0	27,2	60	60	0	100	
	Office applications		63,2	20,5	60	60	20	100	
	Complex tasks		48,6	22,1	40	40	0	100	
	Overall	37	54,4	9,6	52	56	32	76	
	HAG: J = NMgr. Special pedagogy (nonTE, 1Y, FT)								
	Internet Search	34	79,4	22,0	80	80	20	100	
	Internet Safety		35,3	24,3	20	40	0	80	
Social networking	55,3		23,8	60	60	0	100		
Office applications	59,4		17,1	60	60	20	80		
Complex tasks	52,4		23,8	60	60	0	100		
Overall	34	56,4	14,3	52	56	16	76		

Conclusions

In the Czech schools, information and communication technologies are not used at a level required by the needs of the modern information society, in accordance with the actual results of the educational research and global trends in the world. There are exceptions in the positive as well as negative sense. Respondents can be found in the whole range of e-skills—from individuals without functional digital literacy to people with excellent ICT competencies. It seems that the Master degree graduation leads to an improvement in the e-skills, but this improvement is not significant enough. This may be due to the relatively rapid obsolescence of user ICT knowledge and skills or by preserving/fixing digital skills and knowledge at the secondary school level.

It was found that all participants including prospective teachers have significantly bad results in the area of internet safety, the vast majority of students do not know the principles of digital safety which they cannot teach their pupils. That seems to be an important problem in the education of pupils with special education needs because pupils with SEN are a risk group due to the limitations from their disabilities.

It must be clearly stated that the detracting of systematic and comprehensive training in the field of digital technology leads to worse knowledge and skills of ICT users and negatively reflects in their digital competence.

From this perspective, it is necessary to support activities aiming to improve the quality of ICT training of prospective teachers, both in terms of general digital knowledge and skills, and in terms of making better use of ICT in didactics. Results of the IT Fitness test are just another argument for the full implementation of the Strategy for Digital Education 2020 in the Czech Republic, which states: *“It seems that a relatively large investment in teacher training in the use of digital technologies has not a whatsoever effect, because the newly acquired skills in the use of digital technologies are not applied in practice. This is probably due to the fact that the effective use of digital technologies is not supported nor included in our curriculum, nor in the career system. The interconnection of different learning environments is still not used in education—it can be a school or class, but also a home, a virtual online environment, various forms of informal learning (in peer groups, in leisure, etc.). Just outside the school environment, the digital technology is used commonly and often in the inspiring ways the school education would benefit from.”*

Beyond that above stated, it seems that relatively poor results of the IT Fitness test can be probably caused by both ineffective application of technology in the teaching practice and a formalism in teacher training in ICT skills, which leads to an illusory improvement of digital knowledge and skills of teachers without a relevant impact on their functional digital literacy.

Acknowledgements

This paper was supported by the UJEP project IG IPRVO 2016 *Digital skills of prospective teachers* No. 43213 16 0003 01 and the Slovak Republic project Kega 033UK-4/2014 *Support for innovation and the creation of an inclusive environment in higher education of students with health impairment—the principles, goals, methods, tools and conditions*.

The authors thank the staff of the *House for International Cooperation* and the *IT Association of Slovakia* for the kind prolongation of the IT Fitness Test 2015 public testing by the end of 2015—the surveying of UJEP, TUL and UNIBA students wouldn't have been possible without that. The *IT Fitness Test* is a part of the fourth annual European campaign *e-Skills for Jobs 2015* supported by the *European Commission*.

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How to Cite this Paper

PEŠAT, P., LOPÚCHOVÁ, J., LANGER, J., SLÁNSKÁ, D., 2016. E-Skills of Prospective Teachers. In: KOOLS, Q. et al, eds. *Educating the Best Teachers: a Challenge for Teacher Education. Proceedings of the 41st Annual ATEE Conference, 22–24 August 2016, Eindhoven, the Netherlands*. Brussels: ATEE, pp. 98–105. ISBN 9789082506525.