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IT SKILLS IN SLOVAK SCHOOLS: RESULTS OF THE ESKILLS IT FITNESS TEST 2010

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Abstract. The eSkills IT Fitness test 2010, conducted during February 2010 in Slovakia produced a sample of 39,803 completed tests. From this data, we aimed to observe how IT skills are developed in students at primary and secondary schools and as well during the university studies. We compared different types of schools as well. We learned, that these skills are mainly developed during primary and secondary education. We also learned that the 9th grade of primary education does not contribute to IT skills at all and that secondary grammar schools are way ahead in development of these skills in their students compared to other types of secondary education in Slovakia.

Keywords: IT skills, IT skills development, primary schools, secondary schools, universities

1. INTRODUCTION

The European eSkills week 2010 [1] was fired during the first week of March as a wide campaign promoting IT skills and aimed primarily towards young people. Over twenty two countries in Europe participated. In Slovakia the campaign was organized by the IT Association of Slovakia (ITAS) and one of the prime activities was the IT Fitness test [2]. The main goal was to survey the level of basic IT skills, particularly in the students of secondary schools and universities. Our motivation was to learn whether the school gives them enough information and opportunities to acquire relevant IT skills.

The test was delivered via a dedicated Web page, it was open for the public and widely promoted in the media. Anyone could be tested. Testing was open for whole month and concluded during the eSkills week. In total 55,380 respondents have participated, which gave us a sample of 39,803 after excluding obvious nonsense and applying other exclusion criteria.

The analysis of this data confirmed some of the well known stereotype assumptions such as male participants performed slightly better than female participants and that the age groups between 20 to 35 years of age proved the most skilled in IT. We have also learned that the basic IT skills, being the subject of the test, are mostly developed in students during the primary and secondary levels of education; during the university studies these basic skills are not developed so much anymore (the level is already quite high). Focusing on different stages of education and different types of schools, we have also learned that the 9th grade of elementary schools brings zero contribution to IT skills and also that the development of these skills in students of secondary vocational and secondary training schools during the four years spent at these schools is smaller than we would like to see. We suggest that further research should be conducted at these schools and if these results are confirmed, the development of relevant IT skills in the students at these schools should be improved.

2. ESKILLS IT FITNESS TEST

Given our primary target group (i.e., young people, especially high school and university students), we based the test partly on the applicable Slovak high school standards in informatics [3]. However, as it was our aim to measure the true IT fitness of our respondents, we also took into account other applicable standards, for instance the European Computer Driving License (ECDL) and its syllabus [4].

The test was organized into three logical parts. In the first part (Profile) we collected basic demographic data of the respondents, such as age, sex, school/occupation, address.

In the second part (Self evaluation), the respondents were asked 24 questions in order to self-asses their IT skills. We asked how often and for what purposes they used computers, what were their activities on the Internet, social networks and so on. Due to lack of space we do not take the second part into account in this paper, therefore we omit the details.

The third part (Main test) consisted of 24 closed choice questions with one or more possible responses. Often there were multiple correct answers. The questions covered seven broad topics related to IT; some questions belonged to mul-

tiple topics. Since the target group was relatively broad and heterogeneous there were easier and also more difficult questions in each area. For each of the 24 questions we used a pool of 4 possible questions of which only one randomly chosen was asked to each particular respondent. A brief description and a sample question from each area follows. Correct answers are marked up with an asterisk (*).

A. basics

This area included questions about the use of basic computer software in the data creating, searching, processing and transmission. A sample question from this area: *How can we transfer data between two computers that are not directly connected?*

1. through a PC-tablet;
2. with a USB memory stick*;
3. using the keyboard shortcuts for copy and paste;
4. via Bluetooth*;
5. using the keyboard shortcuts for cut and paste.

B. data formats and compression

This area was focused on the respondents' knowledge about what data formats are appropriate for which purpose, how to distinguish among them, which file types contain compressed data and the like. A sample question from this area: *Which type of images does not lose quality with scaling?*

1. vector images*;
2. raster images;
3. neither vector nor raster graphics;
4. photographs;
5. none.

C. hardware

Here, we tested how respondents are familiar with computer hardware, PC components, I/O devices, etc. A sample question: *Your friend wants to buy a laptop computer which should be small, should have as large hard drive as possible, could be connected with TV and which does not need cables for connecting to the Internet. Other features are not important. Which of the following do you advise him?* Possible answers comprised five descriptions of different laptop computers of which only one met best these requirements.

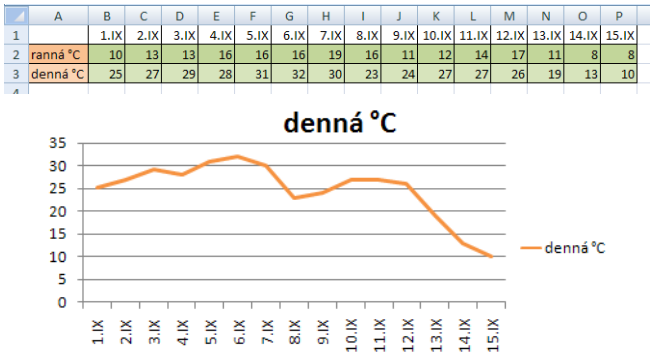
D. operating system and software

This area covered the user's perspective of the operating system, and varied well known software mostly, for MS Windows. Basic knowledge about software licences was included as well. A sample question form this area: *Among the most popular e-mail clients we find:*

1. MS Excel;
2. Mozilla Thunderbird*;
3. MS Access;
4. MSN Messenger;
5. Pidgin.

E. office software

In this area, we asked the respondents about word processing and spreadsheets. A sample question: *Which area of the spreadsheet has to be chosen in order to create the following chart?*



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
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2	ranná °C	10	13	13	16	16	16	19	16	11	12	14	17	11	8	8
3	denná °C	25	27	29	28	31	32	30	23	24	27	27	26	19	13	10

1. A1: P1, A3: P3*;
2. A2: P3;
3. A1: P3;
4. B3: P3;
5. B1: P1, B3: P3.

F. Internet

This part served to determine the knowledge of respondents regarding the Internet as a data source and also as a mean of communication. Some questions in this area were explicitly practical. Using the Internet the respondents had to find relevant information. A sample question: *What is the number of trains from Košice to Bratislava on Sunday between 10 am and 2 pm?*

1. three*;
2. four;
1. two;
2. one;
3. five.

G. social, legal and safety aspects of IT

This broad area covered spam and fraud e-mail, copyright issues, information security and the like. A sample question: *You have found an interesting website with articles and pictures that match very well with your seminar assignment topic. Can you copy this content directly to your paper?*

1. I can copy, if it is explicitly allowed on the website, or if the content is published under a licence which permits it and I meet all the conditions of the licence*;
2. I can copy if I credit the source;
3. if there is "copyright" marked on the page, I can not copy, but if there is not, I can;
4. I can always copy although it is illegal, but in practice I will not face any sanctions;
5. I can only copy a short section/part which I have to quote properly and credit the source*.

For full details on the questionnaire please refer to the associated technical report [5].

3. SAMPLE DEMOGRAPHICS

The total number of 55,380 respondents participated in the test. Out of this number we filtered out obvious nonsense and also questionnaires which were not sufficiently compete: we excluded those which failed completely fill in the first two parts (Profile and Self-evaluation) as these two parts were required for breaking down the results. For the

Main test, we required that at least two questions are answered.

After applying these exclusion criteria the sample was narrowed down to 39,803 respondents. Out of these, 41% were female and 59% were male respondents.

The test was widely administered in schools. Especially secondary schools were the most active. With participation of some elementary schools we managed to sample pupils from 8 years of age. The highest age indicated by participants was 76 years. The distribution of different age groups detailed on Fig. 2.

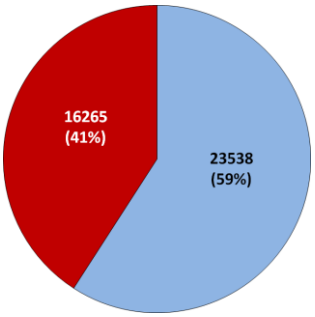

Fig. 1. Break down of female and male participants.
male; female

Our primary target group for this research were young people aged 15-24 years, especially students. This group formed 77,24% of our respondents when distinguished by age; 79% of the sample marked themselves as students. With the students also their teachers were sampled; which gave us the total of 1035 responses from teachers amounting to 3% of the sample, as shown on Fig. 3.

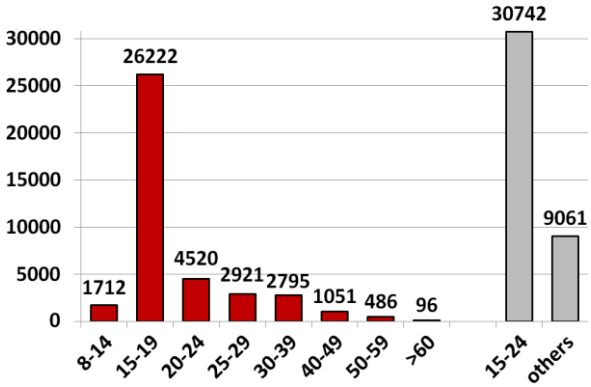

Fig. 2. Distribution of age groups

There are different types of secondary schools in Slovakia, which we aimed to compare. The first type is the 4-year secondary grammar school (4-year SGS), which admits students after the 9-year elementary school and provides general education aimed to prepare students for the university. It covers grade levels 10–13 and corresponds roughly to American high school or to upper level of high school and sixth form college in England. Another type is an 8-year secondary grammar school (8-year SGS) which covers grade levels 6–13. These schools admit students after first five years of an elementary school. The third type is the secondary vocational school (SVS). These are generally schools offering 4-year vocational training. Their graduates are prepared directly for their jobs with industry, economy, health care, etc., but may also choose to continue at the university. The fourth type is the secondary training school (STS) offering 2 but more often 3–4 years of apprentice training combined with vocational education and prepares students particularly for blue-collar occupations. Both SVS and STS admit students after 9-year elementary school.

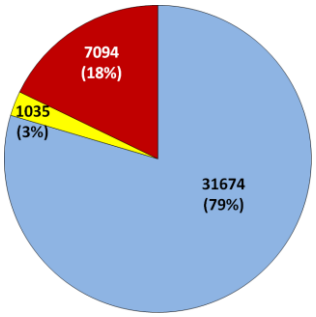

Fig. 3. Number of teachers, students and others.
teachers; students; others

In our sample, most data from secondary schools was from SVS, only one 1% of this data was from STS which still amounted to 236 respondents. For details, see Fig. 4.

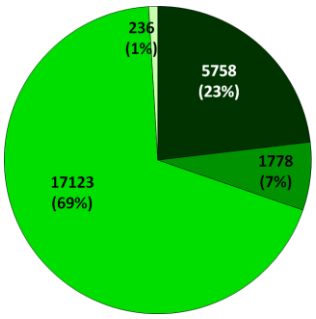

Fig. 4. Volume of data for different secondary schools.
4-year SGS; 8-year SGS; SVS; STS

4. RESULTS

The overall average result ranging over the 39,803 participants of the cleaned out sample was 54.50% with the standard deviation of 19.30%. For our primary target group the average result was 51.60% with the standard deviation of 18.52%. The remaining 9061 participants reached the average result of 64.30% with the standard deviation of 16.46%.

Age groups and gender

In this section we detail the results for different gender and age groups. The average result for the female gender was 47.50% and for the male gender it was 59.30%. These findings confirm the common stereotype that male population is

more attracted to information technology and therefore more skilled with it. However, as we can see from Fig. 6, with rising age this difference lowered.

The results for different age groups are showed on Fig. 5. The highest success rate (70.70% and 69.70%) was recorded for the age groups 25–29 and 30–39 years of age. The lowest success rate was recorded for the age group 8–14 years of age.

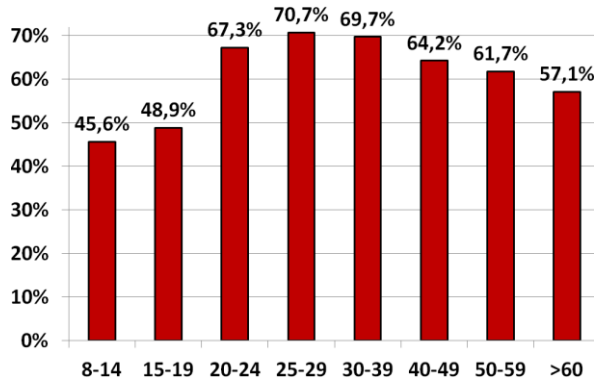

Fig. 5 Average success rate for different age groups

If we consider female and male respondents within same age groups (Fig. 6), we observe that male respondents performed consistently better in all age groups, however with higher age the difference lowered, almost diminishing after 60 years of age.

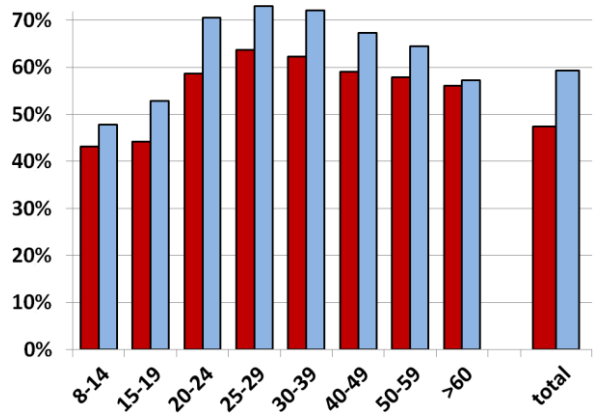

Fig. 6. Average success rate for different age groups and gender. male; female

The reader may find it surprising, that young participants performed significantly worse than seniors. This is in great contrast with some theories hypothesizing high level of computer skills in the young generation [6]. We must consider however that the test was widely administered in primary and secondary schools, whereas in the age groups over 20 years of age the participation in the test was on voluntary basis. Most probably people with interest in IT formed the majority of participants in these age groups.

Topics of the test

Out of the topics of the test, the most successful turned out to be Basics (78.20%) whereas the least successful quite surprisingly was the Internet (45,80%).

As we can see, the success rate for each topic approximately copies the overall success rate albeit with different scale. There are subtle differences, most remarkably the youngest age group (up to 15 years old) is more knowledgeable about the Internet than Office software. This is however, quite natural to expect.

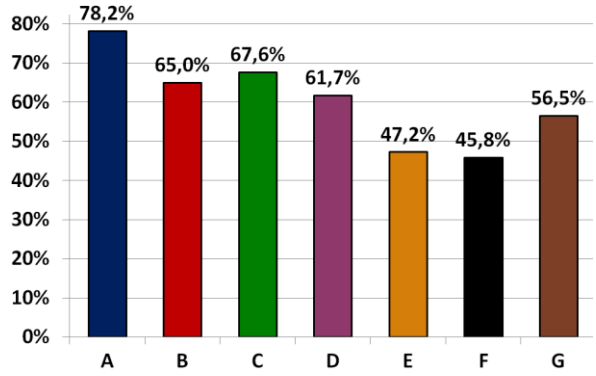

Fig. 7. Average success rates for test topics

We did not find anything exceptional when comparing different topics with respect to different gender; for all topics male respondents performed better than female respondents. When comparing the topics with respect to age (Fig. 8), we observe that the 30–39 years of age the knowledge of all topics is declining. This decline is remarkably strong for the topic of Internet.

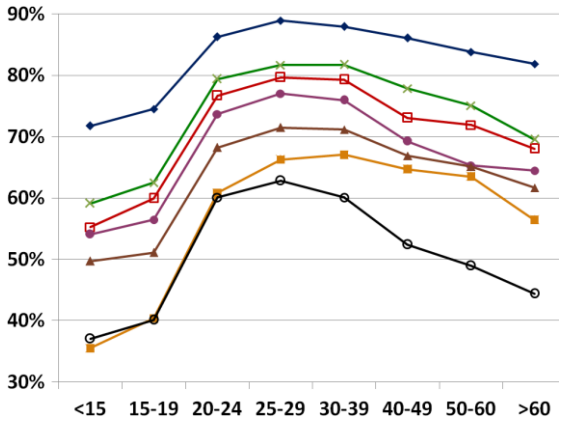

Fig. 8. Success rates for test topics and age groups.
A; B; C; D; E; F; G

The most successful topic was Basics. The least successful were the Internet and Office software. The latter is again quite natural, as the topic included also more advanced questions related to use of spreadsheets. However, the overall low success rate within the Internet topic comes to our surprise. It must be noted that the questions related to this topic came to the end of the test and many of them had form of a practical assignment which could possibly cause that some users ignored them which rendered as negative result.

Out of the individual questions, the most successful (92.6%) was the question #1 dealing with the use of basic software (*Which program would you use to write an application, edit a photo, send an e-mail*, etc.), which belonged to Basics. The least successful (28.9%) turned out to be question #23

from the topic of Internet. This was a practical assignment, where the respondents were given an excerpt from a popular song lyrics and they were asked to look up information related to the artist, album, etc.

Primary target group

The primary target group were young people between 15 and 24 years of age. Our aim was to track down and compare the development of these basic IT skills in schools of different type and different level. The test was widely administered in primary and secondary schools, where also teachers undertook it. Let us first compare different types of primary schools and secondary grammar schools. We were especially interested in the comparison of students who attend 9-year elementary schools (ES) followed by a 4-year SGS, which is a classical system in Slovakia, on one hand, and those who switch to 8-year SGS after the 5th (previously 4th) grade of ES. This comparison is showed on Fig. 9.

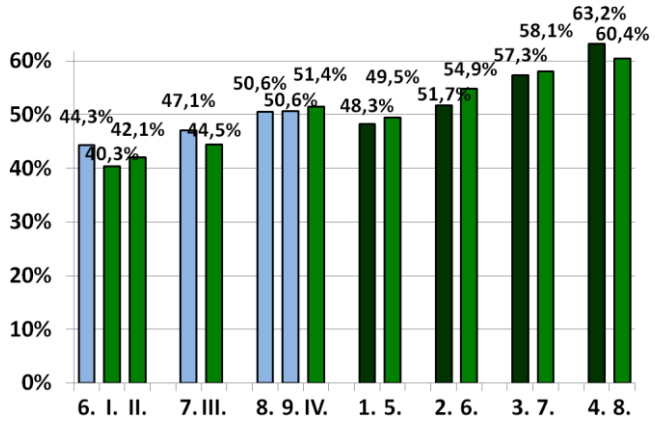

Fig. 9. Success rate: matching grades of ES and SGS.
ES; 4-year SGS; 8-year SGS

The results imply that, what regards to development of basic IT skills in students, the 8-year SGS seem to be more effective in the first half when compared to the respective period of ES. On the other hand, they seem to be less effective in their second half when compared to more classic 4-years SGS. This is quite surprising, as this alternative system of secondary education is generally praised as more effective. We also observe from the results, that the additional 9th grade of ES, which was only recently added to ES in Slovakia, does not contribute at all to IT skills development. Furthermore we compared different types of secondary schools that are typical in Slovakia, see Fig. 10.

We again observe that while in the 1st grade the 8-year SGS were most successful, while in the last grade the 4-year SGS outperform them. Students from these two types of schools were significantly more successful than their peers from SVS and STS. On one hand, this was expected, as the former two types are intended to prepare their students for the university and the latter two type are intended to prepare their students to enter the praxis directly after the secondary school. It is well known, that the most talented pupils choose grammar schools for their secondary education. On the other hand, we find it alarming, how little the students of SVS and especially STS progress in IT skills development over the course of four years. In particular, the average success rate of the STS graduates was lower than the overall average success rate of the ES graduates.

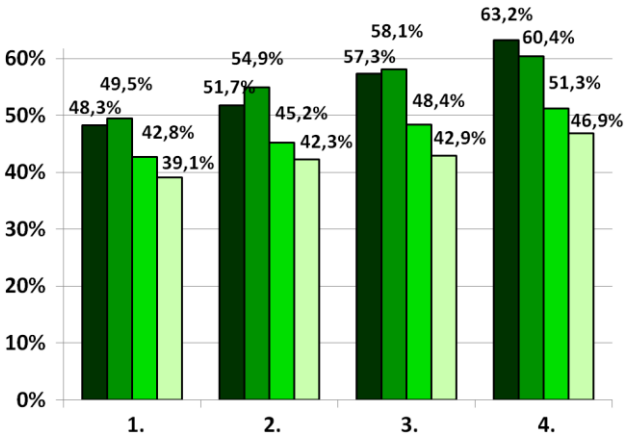

Fig. 10. Success rate: secondary schools by year.
4-year SGS; 8-year SGS; SVS; STS

Finally, turning our attention towards universities, we must remark that due to our uneven sample we cannot really accurately compare secondary schools with universities, as students of secondary schools were widely sampled, but the university students only participated voluntarily. What we observe from our data is that the basic IT skills which the test evaluated are no longer significantly developed at the university. Observe from Fig. 11.

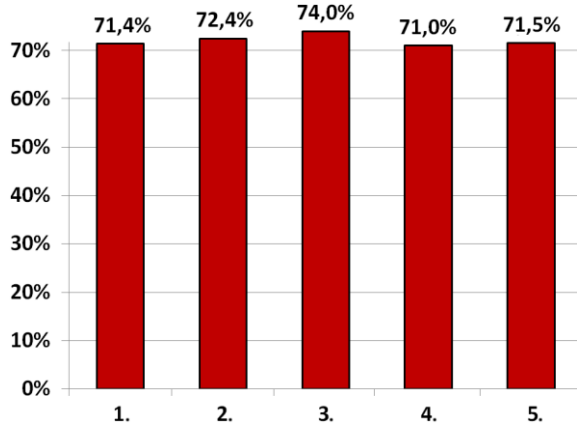

Fig. 11. Success rate: university students by year

The only exception was recorded when we break down the result according to the topics of the test. For one of our most difficult topics, the one of Office software, slight progress (from 64.7% to 68,6%) was recorded over the first three years of the university.

5. CONCLUSION

In February 2010, in association with the European eSkills week [1] activities in Slovakia, a large number of respondents participated in so called IT Fitness test, leading to a

sample of 39,803 completed tests which we processed in order to learn about basic IT skills in the population.

Our research confirmed some of the well known stereotype assumptions such as male participants performed slightly better than female participants. The age groups from 20 to 35 years of age are the most skilled in IT, whereas younger participants (elementary and high school students) are still developing these skills. Also, with rising age, especially over 40, these skills are generally decreasing in the current population.

Our primary target group comprised of young people between 15 and 24 years of age, especially high school and university students, where we tracked the development of IT skills over the course of school grades. We found that the basic IT skills are especially gained during the period of elementary and secondary education. During the course of university years, no significant increase was observed any more. Please note that we did not research whether the skills are being verified as part of the school activity or by self-study or during free-time activity.

Out of the more surprising results the test also showed that during the 9th grade of elementary school, which was only recently added into the education system in Slovakia, no increase of IT skills was recorded. In addition we have learned that the performance of secondary vocational schools and secondary training schools (see description in Sect. 3) is very low with respect to the development of IT skills in their students. We found out that the average success rate of the secondary training school graduates is lower than that of the 9th grade of elementary students. It must be noted, that generally the least talented pupils choose this schools as they are the easiest and prepare students directly for their jobs. Nevertheless, the figures we recorded are alarming. Basic IT skills undoubtedly belong among the most important assets in the knowledge society, therefore their development in schools is very important from the socio-economic point of view. We suggest that the performance of these schools in this respect should be more thoroughly verified by future research.

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