Comparison of the ICT literacy level of the entering students in the Mexican and Serbian higher education

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Abstract. Communication and technology have an important role in life and especially in education. Nowadays, students generally use technology for communication. When using technology in education, there may be some communication barriers. An international comparison analysis tool is an effective way for understanding the situation between two or more different regions of the world. In this sense, literature shows the relevance of analyzing how ICT has been used in education to better understand educational strategies, learning methods and pedagogical techniques in order to effectively apply ICT in the classroom. The purpose of this study is to identify the levels of ICT Competencies of students from two countries, from two continent, one in Serbia (in Europe) and the other in Mexico. We have to see the ICT knowledge level of the students to make decision about the application and retraining methods.

1 Introduction

The students generally use technology for communication in the Europe and in Mexico. We have to see in this research the ICT knowledge level of the students in the higher education to make decision about the application and retraining methods It is important to know can we find any difference in ICT literacy between the Serbian and the Mexican entering students in the higher education to see how long is the way to finish the ICT revolution in these countries. On the other hand is it important to see which topic need more attention from the teachers in the high school to give a good knowledge for the student before they go in the higher education

2 Information technology education in Serbia

The education of Informatics from the 1nd grade has been compulsory since the school year of 2008/2009, following the National Educational Program. It is compulsory to have 1 Informatics lesson a week in the junior section (1st-4th grades) [1, 2]. The learning material

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include the basic knowledge about computer, Painting program, Word processing, Presentation and e-mail. In the senior section (7th-8th grades) is it just selectable on basic level. The learning material include programming, creating web pages and using multimedia devices. The students have to chance to choose the technical-informatics direction, in that case they spend 2 lessons a week with this subject.

In the secondary grammar school have the students more chance to learn more about ICT. In generally 2 lessons per week is the opportunity the learn ICT, except the students in Art school, where they learn ICT just in the first grade. The learning material include programming, database management and Web 2.0 materials. The students in a specialized secondary grammar schools (natural science and computer science) can spend 12 lessons per week with ICT. The problem is the learning material is not parallel with ECDL, it gives not same knowledge [3].

3 Information technology education in Mexico

The primary education is six years in length and runs from grade one through grade six and the content based on the national curriculum while the National Institute for Assessment of Education but not include Information Technology as subject in education.

The lower secondary education is three years in length and runs from grade seven through grade nine. The students follow either an academic track or a technical track but not include Information Technology as subject in education.

Upper secondary education is a further three years in length, after three years of lower secondary, and runs from grade 10 to grade 12 and it is the first level where ICT appear in official education form. In the general secondary school are 6 hours per month for Computer Science on the academic track and 3 hours per month for ICT on technical track.

The Serbian students get more ICT lessons from the 1st grade to the end of the secondary grammar school, than the Mexican students.

Our starting hypothesis after get to know the Serbian and the Mexican ICT Education, the Serbian Students will reach better results.

4 Analyzing students' ICT literacy level

The purpose of this study is to compare the ICT literacy level of the entering students in the Mexican and Serbian universities.

The number of participants: The sample consisted of 528 students, 226 Serbian and 302 Mexican students (Table 1.).

Table 1. The number of participants by gender and country

	Male	Female	Total
Serbian	92	134	226
Mexican	151	151	302
Total	243	285	528

The students filled out a self-reported questionnaire with 15 items (Table 2). We have used Likert-type rating scales to measure the ICT literacy level of students [4].

Liker scales are commonly used by self-reported questionnaire, providing a range of responses to a given question or statement [5]. There were 4 categories of response: 1 = basic level; 2 = medium; 3 = advanced, 4 = „master".

The reliability of the questionnaire obtained by the technique of Cronbach-α was 0.906 it means the reliability of the questionnaire is very good.

4.1 The results of Independent Samples Mann-Whitney U test

The Likert scale is ordinary scale, and as such we can calculate mean, min, max, median, modus, std. dev. etc. We can use the nonparametic tests where we need ordinary variables. We have two independent samples so we could use the Mann-Whitney-Wilcoxon test for 2 samples [6]. The Mann-Whitney-Wilcoxon test seems better choice versus t test by Likert-type data [7], because it is testing the medians of the samples.
We used the Mann-Whitney independent sample U test of SPSS to compare the means of scores taken by the students. Monitoring was held on p=5% significancy level in the whole analyzing process.
We used 2 different ways of comparison: by countries and by gender in Serbia and in Mexico

4.1.1. The results of Independent Samples Mann-Whitney U test by countries

Table 2. The results of Independent Samples Mann-Whitney U test by countries

Number of item	Item	Mexican (Mean score)	Serbian (Mean score)	p
1	Handling Operating System (OS)	2,61	2,66	0,53
2	Word processor	2,76	3,03	0,00
3	Spreadsheet	2,50	2,60	0,29
4	Database Management	2,33	2,04	0,00
5	Multimedia	2,53	2,57	0,68
6	Software specific to my degree	2,17	2,08	0,22
7	Using documentary bases (Such as EBSCO)	2,31	2,03	0,00
8	Web Browsing	3,01	3,24	0,05
9	Internet Communication	2,90	3,31	0,00
10	Internet Safety	2,52	2,65	0,21
11	Website design	2,30	1,82	0,00
12	Using learning platforms	2,22	1,69	0,00
13	Image Editing	2,40	2,58	0,05
14	Video Editing	2,21	2,03	0,02
15	Creating simulations and animations	2,31	1,73	0,00

According to the table we can see the scores of the students from different countries (table 2.); we can see that the subjective ICT literacy level of Serbian students is significant higher than the Mexican students by "Word processor", "Web browsing", "Internet communication" and "Image Editing". The Mexican students reached significant higher srore by "Database management", "Using documentary bases", "Website design", "Using learning platforms", "Video editing" and "Creating simulations and animations". It means the Serbian students can not take the advantages of the higher number of ICT lessons.

4.1.2. The results of Independent Samples Mann-Whitney U test by gender

We have seen the Serbian students reached significant higher scores by some items than Mexican students, but he Mexican students have more reached significant higher scores. It is important to see, the difference is same by the genders too, or not. We calculated the mean scores by items and also calculated the difference between them grouped by genders. Then can we make analysis process with Mann-Whitney U test by male (Table 3.) and female students (Table 4.).

Table 3. The results of Independent Samples Mann-Whitney U test by male students

Number of item	Item	Mexican male (Mean score)	Serbian male (Mean score)	p
1	Handling Operating System (OS)	2,52	3,11	0,00
2	Word processor	2,71	3,22	0,00
3	Spreadsheet	2,48	2,78	0,02
4	Database Management	2,37	2,22	0,13
5	Multimedia	2,48	2,88	0,00
6	Software specific to my degree	2,16	2,24	0,61
7	Using documentary bases (Such as EBSCO)	2,36	2,10	0,03
8	Web Browsing	2,99	3,46	0,00
9	Internet Communication	2,83	3,45	0,00
10	Internet Safety	2,47	2,82	0,01
11	Website design	2,31	2,16	0,17
12	Using learning platforms	2,21	1,77	0,00
13	Image Editing	2,38	2,59	0,11
14	Video Editing	2,19	2,41	0,08
15	Creating simulations and animations	2,27	1,92	0,00

According to the table (Table 3.) we can find same significant differences by every items as sooner but by different items. The subjective ICT literacy level of Serbian male students is higher by 7 items as the Mexicans. On other hand the subjective ICT literacy

level of Mexican male students is higher by 3 items as the Serbians by "Using documentary bases, by "Using learning platforms" and by "Creating simulations and animations".

Table 4. The results of Independent Samples Mann-Whitney U test by female students

Number of item	Item	Mexican female (Mean score)	Serbian female (Mean score)	p
1	Handling Operating System (OS)	2,70	2,35	0,00
2	Word processor	2,81	2,90	0,48
3	Spreadsheet	2,52	2,47	0,64
4	Database Management	2,28	1,93	0,00
5	Multimedia	2,57	2,35	0,06
6	Software specific to my degree	2,18	1,98	0,05
7	Using documentary bases (Such as EBSCO)	2,25	1,99	0,03
8	Web Browsing	3,03	3,10	0,97
9	Internet Communication	2,97	3,22	0,13
10	Internet Safety	2,56	2,53	0,59
11	Website design	2,30	1,58	0,00
12	Using learning platforms	2,23	1,64	0,00
13	Image Editing	2,42	2,57	0,22
14	Video Editing	2,23	1,77	0,00
15	Creating simulations and animations	2,36	1,59	0,00

According to the table (Table 4.) we can find significant differences by the fewer items by female students than by male students, so the situation changed by girls a little bit. The subjective ICT literacy level of Mexican female students is significant higher as the Serbian female students by "Handling operating systems", by "Database management", by "Software specific to my degree", by Using documentary bases", by "Website design", by Using learning platforms", by "Video Editing" and Creating simulations and animations". On other hand the subjective ICT literacy level of Serbian female students was not higher by any items. It means the gender gap is very deep by Mexican and Serbian students.

5 Conclusion

In this research we have tried to analyze the subjective ICT literacy level of the Serbian and Mexican students in the higher education. We have used a self-reported questionnaire with 15 items and Likert-type rating.

After the analyzing process we can say the subjective ICT literacy level of Serbian students by 5 items is higher than Mexican students and by 6 items the Mexican students are better.

We have made more analysis by gender. In the following we share the important information connection with it.

We have found more significant differences by male students than by countries. It means the subjective ICT literacy level of Serbian male students is higher as the Mexican male students except by "Using documentary bases, by "Using learning platforms" and by "Creating simulations and animations" where the Mexican male students reached significant higher scores. It means the Serbian male students can take the advantage of the higher ICT lessons from the primary school to the final exam.

The results by female students totally different. The Mexican female students reached significant higher scores by 8 items by "Handling operating systems", by "Database management", by "Software specific to my degree", by Using documentary bases", by "Website design", by Using learning platforms", by "Video Editing" and Creating simulations and animations". The Serbian female students did not reach significant higher scores by any item as the Mexican female students. It shows the subjective ICT literacy level of Mexican female students is higher than the Serbian female students in the higher education.

The gender gap by female students is deeper than by male students between Mexico and Serbia.

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