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Access and perceived ICT usability among students with disabilities attending higher education institutions

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Abstract An increasing number of students with disabilities are attending higher education. These students might face various difficulties coping with academic skills and with learning methods compared to students without disabilities. Integrating information and communication technologies (ICTs) in academic studies may be effective and constructive for students with and without various disabilities, as ICTs can provide students with adaptive ways to compensate for disabilities and enable them to improve learning. The present study examined students' knowledge of and accessibility to ICTs and it examined students' perceptions of the ICTs used by professors teaching in a face-to-face traditional postsecondary educational institute (in Canada)

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and a distance/blended learning higher education institute (in Israel). The sample included 309 Canadian students and 963 Israeli students who completed questionnaires regarding ICT usage, accessibility, and perceived use by professors. Findings reveal that Israeli students reported higher use and greater accessibility of ICTs and they also reported higher use of ICTs by professors. For both groups of students – those with and without LD/ADHD - accessibility to ICTs was predicted by self-reported knowledge and use of ICTs, professors' ICT use, gender and nationality. The study's findings and its implications are likely to be important for promoting access to ICTs for students with and without disabilities in both the traditional higher education modality and in distance/ blended learning contexts.

Keywords Accessibility · ICT · Learning disabilities · Higher education

1 Introduction

There is an increasing number of students with disabilities who are attending higher education and studies reveal that these students face various difficulties in coping with academic skills and /or with their ineffective learning strategies compared to students without disabilities (e.g., Heiman and Olenik-Shemesh 2012; Newman and Madaus 2015). Newman and Madaus (2015) present data from the National Longitudinal Transition Study survey in the USA, which reported that only 35% of the students with disabilities attending postsecondary institutions informed the school disability access services about their disability. However, students with learning disabilities (LD) comprised about 70% of the students with disabilities attending postsecondary institutions and approximately 10% of them were diagnosed with attention deficit-hyperactivity disorder (ADHD) as well. As such, students diagnosed with LD are the largest "special education" grouping of students in North America (Bryant et al. 2014). In the USA, it was estimated that during 2011–2012, 11.1% of the Bachelor's degree students had a disability (National Center for Education Statistics 2012). In Canada, estimates of the incidence rate of LDs range upward from 10% of the population (Learning Disabilities Association of Ontario 2015).

In a recent comprehensive description of LD distribution in the Canadian educational system, its prevalence was estimated as 10%, but since LD is a lifelong condition, this is probably an underestimate. The Canadian statistics from 2012 showing that among youth and adult populations, ADHD is considered as a category within LD, and its prevalence rate is 2.3% among 15 year-olds and older. In Israel, approximately 5.6% of the students with LD are studying in higher education (Heiman and Olenik-Shemesh 2012).

Other studies have shown that between 30 and 50% of students with special needs required some form of adaptive software or hardware to enable them to use e-learning and other information and communication technologies effectively (Fichten et al. 2006). Weis et al. (2016) reported that almost 70% of clinicians recommended that students with LD use technology, such as recorded books, text-to-speech, speech-to-text, calculators, spellcheckers, etc.

Bryant et al. (2014) discussed to the importance of adapting and promoting access to technology for students' academic success, as students with LD face various difficulties in

reading, writing, and mathematics. Furthermore, they debate about the major challenges of teachers, who are responsible for either remediating the weaknesses or trying to find ways to help students compensate for them. As never before, teachers are expected to provide high quality instruction so that all students meet high performance standards. It appears that for students with LD, ICTs can promote and facilitate academic success.

ICTs provide students with adaptive ways to compensate for their disabilities, enabling them to utilize compensatory academic skills. ICTs can support writing, spelling, planning, organizing, editing and calculation, help users to study and express their needs (e.g., Heiman and Olenik-Shemesh 2012; Heiman and Precel 2003).

Previous research on different methods of teaching in higher education suggested that the physical separation between students and professors in the distance education model may make the experience of these students different from that of campus-based students, and may involve a considerable amount of independent study (Rumble 1989). A more recent examination of learning styles and students' achievement scores of university students enrolled in distance-learning and in face-to-face classes shows that students' success in both frameworks is similar (Aragon et al. 2002). Studies conducted on students with LD studying at a distance university (e.g., Heiman and Kariv 2004; Heiman and Precel 2003) revealed that these students used different learning strategies than students without disabilities, and that they expressed their need for additional academic and social support differently.

Several studies emphasized the significant change in the usage pattern of technology amongst higher education students with increased access to personal computers. Both learning and practice environments have changed due to the educational use of movies, videos, e-books, science apps, power-point presentations, etc. (Srivastava et al. 2014). For example, the study conducted by Srivastava et al., which included 150 medical students and 10 teaching faculty shows increased use and dependence on computerized technologies; students perceived the technology and computer-training tools as an essential and a mandatory element that was integrated into the higher education curriculum in medical studies. Another examination of the patterns and usage of ICTs among undergraduates with and without LD (Heiman and Olenik-Shemesh 2012) revealed that although students with LD felt comfortable with using the Internet and with the online courses, most of them engaged in passive Internet use and they rarely made academic comments in the discussion/chat groups compared to students without disabilities. However, students with LD perceived the academic sites as important virtual places that permitted asking the professor or the tutor questions or clarifying the learning content. The authors found that regardless of the differences between students with and without LD, all of the students who often used the course website reported higher scores on goal achievement and higher motivation and engagement in their studies.

1.1 Distance-learning universities

The distance education or distance learning model focuses on the instructional systems design and technology that are effectively incorporated in delivering education to students who are not physically in class. It allows communication with lecturers, tutors, or peers synchronously or asynchronously (at times of their own choosing) by exchanging printed or electronic media, or through technology that allows them to communicate in real time. Distance education universities can implement hybrid or

blended courses or programs that require both distance and physical face-to-face presence (for example, for taking exams). Distance education may also use all forms of technology, from print to the computer, including radio, television, audio-video conferencing, e-learning and computer broadcasting (Neidorf 2006). A study examining 472 undergraduate and graduate students enrolled in face-to-face and distance courses in social science regarding issues such as help-seeking behavior, help-seeking tendencies, personal threat in seeking help, and academic self-efficacy, revealed that students attending distance courses seek academic help more easily and more frequently than students attending face-to-face courses in traditional learning environments, and that students preferred to use electronic facilities (Kitsantas and Chow 2007). Fuller et al. (2004) reported that students clearly differed in their willingness to seek support for their impairment, had experienced widely different levels of help from teaching staff and that they varied in terms of accessing information about what was on offer. These differences were not necessarily related to their level of disability or needs. Some had experienced examples of good practice and extensive support for their learning, while others' experience had been less favorable.

The progress in today's technology has created a number of opportunities for improving access to information for people with disabilities. Roberts et al. (2011) examined the perceptions of students with disabilities regarding their satisfaction with accessibility to higher education. Their findings indicate that the majority of the students with a disability reported that their requests for accommodations were met. Further research (Pino and Mortari 2014) that examined the perceptions of students with LD in higher education regarding their professors showed that the students indicated that some of the professors did not pay attention to their disability, and other considered the students' disability as an excuse to get accommodations, or as a kind of laziness. Moreover, Kioko and Makoelle (2014) interviewed students with learning disabilities and their lecturers regarding the learning and teaching experience in higher education. From the students' point of view, they expressed a high degree of satisfaction regarding their learning experiences and commended the hard work of the professors and the university organization for the support they received. However, some students reported incidents where they felt excluded and had some complaints such as, for example, their note-taker was unable to access a lecture hall; lecturers did not provide transcripts of the video clips; students were unable to access learning resources. On the other hand, professors reported that they did not know what was within their teaching responsibility regarding students with learning disabilities in their classroom, and felt either a lack of knowledge regarding learning disabilities, or having a challenging experience in making efforts to support these students. Similar findings were reported by Van Jaarsveldt and Ndeya-Ndereya (2015); their study showed that some professors tended to "transfer" the responsibility for helping students with LD to the university disability support centers, and admitted not having adequate knowledge about teaching or about assistive technology for students with learning disabilities. Others were unaware that there were students with learning disabilities in their class, while some expressed a positive attitude, understanding and willingness to help the students with LD.

UNESCO (2009) requests that higher education professors adopt and implement innovative technologies for teaching in order to obtain better learning achievements. A recent study examined 615 Israeli college teachers regarding their perceptions and

implementations of ICTs (Avidov-Ungar and Forkosh-Baruch 2016). Findings revealed that factors such as technological support and positive perceptions of ICTs might encourage teachers in the implementation of ICT, while lack of time, lack of infrastructure and poor skills might impede the implementation of ICTs. However, although there is an effort at the universities to support students with disabilities, little is known about the perceptions of the postsecondary students regarding their professors' ICT usage.

1.1.1 The present study

From the literature reviews it emerged that differences are expected between students with and without learning disabilities using ICTs. However, few studies have addressed the students' experiences and their perceptions of the professors regarding different higher education teaching methods. Within an innovative collaborative initiative, we examined similarities and differences between Israeli and Canadian views in different academic environments. Students with LD/ADHD comprise a large proportion of the enrollment on both Israeli and Canadian campuses and the literature shows that the quality of the ICT environment available to these students is an important element in student success. Although Israel and Canada are dissimilar in many ways that affect education, what the two countries have in common is extensive use of ICTs in postsecondary education teaching, significant numbers of postsecondary students with LD, and a serious concern with the successful academic outcomes of these students. In addition, in Israel as well as in Canada, the diagnostic criteria for students with learning disabilities and/or ADHD meet the definition of the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition), including normal IQ, cognitive processing deficit manifested in memory, attention, executive functioning and speed processing tests, as well as significant deficits in academic skills.

It might be important to examine two models of higher education systems, compared to traditional face-to face campuses. The Open University of Israel (2017, OUI) operates a "flexible" delivery mode as the students may choose to be to be present in a classroom, or to be a part of distance education. The OUI offers distance education at all levels of studies, and enables access to blended courses or programs, and students can attend physical on-site courses as well as participate in distance learning.

Therefore, the goals of the present comparative study focused on three main issues. First, to examine the ICTs used by students, with and without disabilities attending higher education institutes within a traditional face-to-face teaching model (in Canada) compared to a distance teaching and learning model, mostly using online courses (in Israel). Second, the accessibility of ICTs for learning purposes is examined across both countries, regarding perceptions and gender of students with and without disabilities. Third, the study compares the students' perceptions of their professors' use of ICTs.

Following the three research goals, three main hypotheses were established. First, it was hypothesized that students attending a distance learning university will report on more intensive use of ICTs, will have more knowledge and greater access to ICTs compared to students attending a traditional educational institution. Second, it was expected that students with learning disabilities in both countries would use more ICTs compared to students without LD. Third, it was expected that professors teaching within a distance learning university will use more ICTs for teaching and assignments compared to professors teaching at traditional higher education institutes.

2 Method

2.1 Participants

The study included 309 students from Canada (126 men and 183 women) and 963 Israeli students (406 men and 557 women). In the Canadian sample the age range was 18 to 42 years (M = 20.5, SD = 4.20), while in the Israeli sample the age range was 18 to 44 years (M = 29.6, SD = 4.86). Within each county, the students who completed the questionnaires were divided into two groups: students with LD/ADHD and students without disabilities as a comparison group. In the Canadian sample 31 students reported being diagnosed with LD/ADHD (13 men and 18 women) and there were 276 students without a disability (113 men and 163 women). In the Israeli sample there were 117 students with LD/ADHD (80 men and 97 women), and 786 students without disabilities (326 men and 460 women). Significant age differences emerged between the two countries, as Israeli students were older than the students in Canada, F (1, 1268) = 876.4, $p < .001$.

A chi-square test was performed for gender distribution across countries. Results show no significant differences between Canada and Israel within the study sample population, X^2 (1) = .18, p = .36. In addition, no significant differences emerged between gender and disability, X^2 (1) = .85, p = .20. A chi-square test was also performed on participants' characteristics (LD/ADHD vs. students without disabilities) and between countries (Canada vs. Israel). Results show significant differences, X^2 (1) = 12.57, p = .001; in the Canadian sample 10.9% were students with disabilities, compared to 22.6% in the Israeli sample. Means and SDs are presented in Table 1.

2.2 Procedure

After receiving approvals from the Ethics Committees of the postsecondary educational institutions involved, 1387 Canadian students enrolled in 56 non-first semester compulsory language of instruction classes completed pencil and paper questionnaires. This was administered to obtain contact information of students who had completed at least four courses and who indicated a willingness to participate in future studies. Of the 437 students whom we contacted by email, 309 completed a 20 min online questionnaire about their college ICT-related experiences.

Table 1 Means and standard deviations: Countries, students with and without LD, age and gender

		Canada		Israel	
		Students With LD/ADHD	Nondisabled Students	Students With LD/ADHD	Nondisabled Students
		M (SD)	M (SD)	M (SD)	M (SD)
Age		20.35 (2.64)	20.53 (4.33)	29.22 (4.85)	29.68 (4.86)
Gender	Men	13	113	80	326
	Women	18	163	97	460

Students in Israel received the same translated questionnaire over the Internet via Google Docs. The questionnaire were sent to a random sample of 2650 Israeli students who had successfully finished at least four distance learning courses.

Students' responses were inserted directly to Excel files. For all the participants, missing data were excluded from both samples, and anonymity was guaranteed for all respondents during the statistical analysis.

Translation procedure We conducted questionnaire translation and assessment from English to Hebrew as suggested by Harkness et al. (2003) using the TRAPD (Translation, Review, Adjudication and Documentation) methodology. This structured approach to translation and assessment reduces the chances of subjective and idiosyncratic features. The TRAPD methodology requires documentation at each stage of the process in terms of the questions asked, the answer structure, explanatory notes and the coding. The translation of the questionnaire represents a team effort with clear separation between translators, reviewers and adjudicators. The translation team comprised a combination of linguistic, cultural and questionnaire survey skills. The basic system of translation was as follows: Step 1: Parallel translation: Two translators, with experience of the subject material and with some knowledge of questionnaires and survey methodology translated the questionnaire and worked independently of each other. Step 2: Review: A graduate research assistant reviewed and assessed the two translations, and compared their suitability for the original questionnaire. Step 3: Adjudication: The team made the final decision based on the translations and on the comments of the reviewers.

2.3 Measures

All students were asked about age, gender, and to self-report their disabilities on a checklist. All measures were translated from English to Hebrew as described above.

Students' knowledge and use of ICTs Two items used 6-point Likert scaling (from *strongly disagree* (1) to *strongly agree* (6)). The two items were: "I am very knowledgeable in the use of computer technologies", and "I am very comfortable using computer technologies." Cronbach's alpha = .91.

Access to ICTs for students' use This scale consists of 9 items using 6-point Likert scaling (from *strongly disagree* (1) to *strongly agree* (6)). For example: "In general, my computer technology needs at my school are adequately met," "In general, my Wi-Fi needs at my school are adequately met". Cronbach's alpha = .76.

ICTs used by the professors This scale consists of 32 items concerning different ICTs used by professors. The ICTs were divided into six types: (1) online course materials (e.g., web links, course notes); (2) online tools (e.g., collaborative work online, videos); (3) hardware (e.g., multimedia projector, interactive white (SMART) board); (4) communication tools (e.g., chat room, email); (5) social networking (e.g., blogs, Twitter); (6) computer technologies used in class (e.g., simulations and presentation software). Each student indicated which ICTs were

used by their professors. For each ICT type, an index was calculated based on the sum of technologies used. Cronbach's alpha = .75.

2.4 Data analysis

First, descriptive statistics was conducted regarding participants from both countries; second, a multivariate analysis of variance (MANOVA) was performed in order to examine differences between students (with and without LD/ADHD), country (Canada/ Israel), and gender (men/femen) on the following three measures: students' knowledge and use of ICTs, accessibility to ICTs, and varieties of ICTs used by professors. Furthermore, two hierarchical regression analyses were conducted separately for the LD/ADHD group and for the nondisabled students group in order to predict access to of ICTs, with the independent variables including students' knowledge and use of ICTs, professors' use of ICTs, country, and gender.

3 Results

3.1 Comparison of students' reports

To compare students' reports, a multivariate analysis of variance (MANOVA) was performed with a 2 X 2 X 2 model: student group (LD/ADHD / nondisabled students), country (Canada/ Israel), and gender (men/ women), on the following three independent variables: students' knowledge and use of ICTs, access to ICTs, and varieties of ICTs used by professors. Results revealed a main effect for country, $F\,(5, 1270) = 62.39, p < .001, \eta_p^2 = .14$, and a main effect for gender, $F\,(5, 1270) = 12.85, p < .001, \eta_p^2 = .03$. No significant main effects were found for LD/ADHD and nondisabled students groups, nor for the interaction between students' group, gender and country.

Two univariate analyses were performed for gender and country in order to examine students' perceptions regarding their use of ICTs, access to ICTs, and the varieties of ICT tools used by professors. As presented in Table 2, findings revealed significant differences between Canada and Israel. The Israeli students reported greater use and accessibility of ICTs, and reported greater use of ICTs by professors. Regarding gender, men students reported knowing and using significantly more ICTs, but women reported

Table 2 Means, standard deviations, and F ccores: Students' Use of ICTs, Access to ICTs, and ICTs used by Professors in the two countries

Variables	Canada		Israel		*F*	Eta
	M	*SD*	*M*	*SD*		
Students' use of ICTs	4.97	1.05	5.32	1.03	26.74**	.02
Access to ICTs	4.36	.74	4.70	.90	37.7***	.03
Variety of ICTs used by professors	7.71	.79	8.20	.73	111.22***	.09

*$p < .05$. **$p < .01$. ***$p < .001$

better access to ICTs than did men. No significant differences between genders emerged for students' reports on professors' ICT use (see Table 3).

Additional univariate analyses were conducted on the students from the two countries regarding the six ICT types used by the professors. Findings revealed significant differences only on country for 5 out of 6 ICT types, as Israeli students reported greater ICT use by the professors: (1) Online course materials, F (1, 1270) = 27.43, $p < .001$, η_p^2 = .02; (2) Online tools, F (1, 1270) = 14.9, $p < .001$, η_p^2 = .012; (3) Hardware, F (1, 1270) = 165.8, $p < .001$, η_p^2 = .12; (4) Communication tools, F (1, 1270) = 17.8, $p < .001$, η_p^2 = .014; (5) Computer technologies used in class, F (1, 1270) = 15.8, $p < .001$, η_p^2 = .012. No significant differences emerged for social networking with the professors, and no significant interactions were observed.

3.2 Correlational analyses

Pearson correlations were conducted separately for each group of students (LD/ADHD and nondisabled students) examining access to ICTs, with students' ICT use, professors' ICT use, students' gender and country. As seen in Table 4, access to ICTs and use of ICTs were more highly correlated within the nondisabled students; access to ICTs and professors' ICT use were more highly correlated within the LD/ADHD groups; gender was significantly correlated with access to ICTs for both groups.

3.3 Regression analysis: Predicting access to ICTs

Two hierarchical regression analyses were conducted, separately for LD/ADHD and nondisabled student groups in order to examine the prediction about access to ICTs (as the dependent variable). The following independent variables were entered in one-step: students' use of ICTs, ICTs used by professors, gender (men vs. women), and country (Canada vs. Israel). Results on predicting access to ICTs show that the two regression models were significant and explained 12% of variance for the LD/ADHD student group: F (4, 203) = 6.65, $p < .001$, R^2 = 12%; and 21% of variance for nondisabled students: F (4, 1059) = 67.57, $p < .001$, R^2 = 21%.

The regression analysis for the LD/ADHD group revealed that all the measures significantly predicted access to ICTs. As such, access to ICTs contributes more to students who are more familiar with the technology or used it more; when the professors

Table 3 Means, standard deviations, and F Scores: Students' Use of ICTs, Access to ICTs, and ICTs used by women and men

Variables	Women		Men		F	Eta
	M	*SD*	*M*	*SD*		
Students' use of ICTs	5.13	1.10	5.39	0.95	18.97***	0.02
Access to ICTs	4.67	0.88	4.54	0.85	6.30**	0.01
Variety of ICTs used by professors	8.10	0.72	8.05	0.74	1.34	0.001

*$p < .05$. **$p < .01$. ***$p < .001$

Table 4 Pearson correlations between access to ICTs, Students' Use of ICTs, gender and country, separately for students with and without LD

Variables	Access to ICTs LD group	Access to ICTs Nondisabled Students
Students' use of ICTs	.14*	.35**
ICTs used by professors	.21*	.16**
Gender	−.14*	−.09*
Country (Canada)	.07	.19**

*$p < .05$. **$p < .01$

use greater varieties of ICTs; access to ICTs are worse for women; and the Canadian students reported better access to ICTs than students in Israel (see Tables 5 and 6). A similar pattern appeared to predict access to ICTs for the nondisabled student group.

4 Discussion

Today, almost all higher education institutes are using a variety of ICTs as an inseparable part of their teaching method for instruction, for practice and assignments, and in order adequately to meet the needs of students in higher education. The aims of the present study were to examine students' access to technology; explore technologies used by professors in their teaching; assess students' perceptions; and to examine similarities and differences between countries. Our findings highlight the importance of the technology as perceived by the students with and without disabilities, from different countries, studying within different models of teaching.

As expected in our first hypothesis that students attending a distance learning university will report on more intensive use of ICTs, will have more knowledge and greater access to ICTs compared to students attending a traditional educational institution, was confirmed. It was found that students attending on distance online learning classes reported greater knowledge and access to ICTs compared to students who mainly study in face-to-face classes. Furthermore, our findings support the third hypothesis, suggesting that professors teaching within a distance learning university will use more ICTs for teaching and assignments compared to professors teaching at

Table 5 Hierarchical regression predicting access to ICTs for Students with LD

Students' Variable	*B*	*SE B*	*β*	*t*
Students' use of ICTs	.15	.06	.17	2.55*
ICTs used by the professors	.06	.01	.28	3.88***
Gender	−.30	.12	−.17	−2.56*
Country (Canada vs. Israel)	.45	.18	.19	2.54*

For Gender, 1 = men, 2 = femen. Country. 0 = Israel, 1 = Canada

$R = .34$, $R^2 = .12$, $Adj.R^2 = .10$, $F(4, 203) = 6.64$, $p < .001$

*$p < .05$. ***$p < .001$

Table 6 Hierarchical regression predicting access to ICTs for nondisabled students

Students' Variable	*B*	*SE B*	*β*	*t*
Students' use of ICTs	.25	.02	.30	10.60***
ICTs used by the professors	.05	.01	.27	8.64***
Gender	−.17	.05	−.10	−3.57***
Country (Canada vs. Israel)	.54	.06	.27	8.54***

For Gender, 1 = men, 2 = femen. Country. 0 = Israel, 1 = Canada

$R = .45$, $R^2 = .21$, $Adj.R^2 = .20$, $F(4, 1059) = 67.57$, $p < .001$

*$p < .05$. ***$p < .001$

traditional higher education institutes. Students reported that the professors teaching in a distance-learning context use more ICTs than do professors in traditional face-to-face classes. The distance-learning education model required various technologies, including virtual classes, submitting assignments by the Internet, as well as using computers or having digital books, which became an inseparable part of the learning environment, and required the use of a variety of tools by the professors. Although the institutions used in this study recommend the professors to participate in ICTs workshops related to academic accommodations for students with LD in their face-t-face or online courses, only few professors volunteered to receive a short training. However, we suppose that teaching in distance higher education, oblige the professors to be more aware to ICTs, and to use it more frequently compared to professors in traditional institute.

The gender issue was not the focus of the present study, but the findings raise interesting differences between men and women. Concerning previous studies on gender differences associated with ICTs, findings show inconsistent results. For example, some studies found no gender differences regarding attitudes towards e-learning (Cuadrado-García et al. 2010; Hung et al. 2010), while other studies (Akturk 2014; Kubiatko 2013; Ilomaki 2011) shows significant differences between gender. These research results indicated that men students use the Internet for educational purposes more than women students do; men students were more involved in Internet-based communication and expressed more positive attitudes towards computers have better skills and are more motivated toward computers than women. Furthermore, it was found (Shinyi et al. 2013) that women reported significantly less comfortable feeling with computers use than the men did, even though most of them had taken computer classes in their high schools and more than 80% of them had taken higher-level mathematics. The authors indicated that during college studies, men students demonstrated better performance than women students did. Although f women interest in computer applications improved, they still do not like the computer as much as men do. In the present study, it was interesting to find that in both countries, men consider themselves as being more knowledgeable than women consider themselves, with no significant differences between students with and without LD. Kubiatko (2013) suggested that the gender differences could emerge from the men perspective that consider the use of ICT as easy as compared with women; men more download music, games and movies compare to women. Ilomaki (2011) suggested that probably ICT skills are more

connected to men culture, and as such, men students tended to present themselves as ICT experts more often than women. However, this issue needs further research.

Our second hypothesis expecting that students with learning disabilities in both countries would use more ICTs compared to students without LD, was partially supported. Consistent with previous studies which reported that ICTs are useful for students both with and without disabilities (e.g., Crivelli et al. 2004), the present investigation shows that most of the students (with and without disabilities) are using the computers for assignments, including grammar and spell checking, graphical organizers, calendars etc., which were considered as accommodation tools for students with disabilities such as learning disabilities, attention deficit hyperactivity disorder, students with memory or organizing problems and those with difficulties in academic skills. However, the present findings indicated medium to low correlations between access to ICTs and ICT usage for students with and without LD, with a higher correlation between ICT use and access to ICTs among nondisabled students than among students with LD (r = 14; r = 35, respectively). This might suggest the need to increase the knowledge of students with LD or their access to ICTs in order to help them with their academic problems.

In addition, analyses predicting students' access to ICTs based on their technology use, the variety of ICTs used by their professors, their gender and country resulted in important findings. First, the same pattern of predictor variables emerges for students with and without LD. This result supports the idea that most students were favorable to ICTs, and that ICTs might help enhance the academic achievement of students regardless of their diagnosis with LD. Second, the positive association between the variety of ICTs professors use and access to ICTs for students might suggest that it is important to support professors in using ICTs and, if needed, to provide a short up-to-date ICT training to professors as this might help all students. Third, as women perceived their ICT use and access to ICTs as worse than did men, it will be important to strongly encourage women to become more familiar with the various technologies available to them.

4.1 Limitation and future studies

Some limitations of the present investigation are worth mentioning. First, the data of the present study represent "a case study" of two higher education teaching models in two countries. Further investigation would be needed to examine participants from additional higher education institutions, with different measures regarding students' academic characteristics, such as grades, faculties or areas of study. As well as further studies are needed in order to clarify how did the students with LD who considered themselves knowledgeable and/or skilled with respect to ICT, compare against those who did not in terms of performance. Second, the findings are based on the students' self-reports about their disability and the professors. A deeper examination of the professors' use of ICTs and further evaluation are needed in order to focus on the specific ICTs that help student learning. Third, the study examined only undergraduates. Future studies should also examine masters and /or doctoral students to learn about their ICT use, their access to ICTs, and their specific needs to help them successfully finish their studies.

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