Implementation of information and communication technology in higher education: Comparative research in Asian, American and European universities

Violeta Vidaček-Hainš
Faculty of Organization and Informatics, University of Zagreb, Pavlinska 2, 42 000 Varazdin, Croatia
vvidacek@foi.hr

Victoria Appatova
University of Cincinnati PO Box 210205, Cincinnati, OH, USA
appatovs@ucmail.uc.edu

Harry Prats
University of Cincinnati PO Box 210205, Cincinnati, OH, USA
pratshj@ucmail.uc.edu

Kenjiro Takemura
Keio University 3-14-1 Hiyoshi Kohoku-ku, Yokohama, 223-8522 Japan
takemura@mech.keio.ac.jp

Liren An
Northwest University No. 299 Taibaibei Road, Xi'An 710069, P.R. China
an060359@yahoo.com.cn

Jozef Bushaty
University of Shkodra` Luigj Gurakuqi`, Shkoder, Albania
jozefbushati@gmail.com

Norbert Berger
Karl Franzens University Universitätsplatz 3 8010, Graz, Austria
bergern@kfunigraz.ac.at

Katarina Pažur
Faculty of Organization and Informatics, University of Zagreb, Pavlinska 2, 42 000 Varazdin, Croatia
kpazur@foi.hr

Abstract. *Usage of information and communication technology (ICT) has become an integral part of higher education. Information literacy is included in the development of university curricula.*

The main goal of this comparative research conducted in six different countries was to estimate the level of student satisfaction with access to different sources of information literacy, such as computer technology and library resources. This research also demonstrates students' desire to improve their oral and written communication skills. Respondents were students from three universities in Europe (in Austria, Albania and Croatia), two universities in Asia (in Japan and China) and one university in North America (in the USA). Results were interpreted in the context of cultural differences.

Keywords: ICT, learning environment, cultural differences

Introduction

Usage of information and communication technology (ICT) has commonly become instrumental for the quality of higher education. The implementation of ICT in the learning process contributes to the effectiveness of a learning environment. Effective learning environment (ELE) is an open system of variable factors that influence the effectiveness of student learning from various perspectives of learners, faculty, administrators and professional staff [1].

Different factors can have an impact on ICT usage. It has been suggested by undergraduate students that less ICT usage may be caused by computer phobia and lower levels of self efficacy [8]. Some of the predictors of effective Internet usage among freshmen are positive attitudes towards computer usage, control over computer usage, an adequate level of Internet competences and basic ICT skills [22]. Kisla et al. [5] analyze the level of ICT usage in university lecture courses. The respondents were 157 lecturers from 9 faculties. Results show that the computer usage depends on the lecturer's gender and academic field. Male lecturers prefer to use ICT more than their female colleagues. Lecturers from technical fields prefer more ICT compared with other colleagues from humanities and social sciences. Information literacy is an important part of university students' learning. According to the National Forum of International Literacy, information literacy is the ability to recognise a "need for information, and to be able to identify, locate, evaluate and effectively use that information for the issue or problem at hand" [9]. The components of information literacy are library literacy (ability to use library resources) and computer literacy (includes computer management skills), as well as basic literacy which includes reading, writing, speaking and listening skills, as reported by Ferguson [2]. All these abilities are very important factors in successful learning.

1.1 Implementation of ICT at European, American and Asian Universities

There are some cultural differences in computer usage among university instructors and their students in different countries. Sánchez-Franco et al. [15] find that the national cultural background of educators has an impact on their willingness to use ICT and, particularly, web based education. Respondents were European educators from higher educational institutions. Results show that educators from Nordic cultures use web sites predominantly for intrinsic enjoyment-based factors, while educators from Mediterranean countries (Portugal, Spain and Greece) use the Internet more for social networking and communication.

Research that has been completed by Paechter et al. [11] shows that student' expectations and experiences with e-leaning have an impact on learning achievements and course satisfaction. The best predictors for success were a student's desire to achieve goals. Research was done with an Austrian sample of students.

There are some interesting results of research conducted among American university students. For example, Tang et al. [18] examined American students' perceptions of enjoyment, learning, motivation and career application related to different teaching technologies (projectors, PowerPoint, video, Internet) compared to classical lectures. They analyzed the relationship between a professor's computer literacy and the students' academic performance. Results of this survey conducted among students show that video provided the highest amount of enjoyment, PowerPoint provided the highest amount of learning, and Internet provided the highest amount of information about future jobs. Older students prefer lectures more than computer technology.

Among case studies of Asian university students, Su [16] reported that courses with implementation of information and communication technologies enhance university students' learning performance more than those based solely on classical lectures. Studies conducted in Asia and published by Pearson [10] emphasize that (a) ICT can be used in problem based learning, both in face-to-face and online learning environments, and (b) new technologies can be implemented for various purposes, but the roles of teachers and tutors remain important in creating effective on-line learning environment. It is also important to note that higher education attendance in China has significantly positive correlations with scholastic ability and parental education. Higher education attendance in China has significantly negative correlation with family income [6]. Research of Sang et al. [14] shows that variables such as the teacher's beliefs, self-efficacy and positive attitudes towards ICT have an impact on computer usage in the university lecturing process. Respondents were lecturers at higher educational institutions in China. There is another important factor in successful learning – a university library. Results of a survey conducted among Chinese students and American international students emphasise the importance of good general library services, policies, free electronic access and the whole library environment [4].

Research that has been conducted among Japanese university students shows that students' understanding of educational technology has an impact on their learning activities: better concept development and better understanding of ICT are linked to more clear determination of goals and learning strategies [3].

1.2 Comparative studies conducted among students in some European, American and Asian Universities

Comparative studies reveal and analyze varieties in the higher education processes caused by cultural differences. Results of a survey administered in 26 countries show that educational practitioners' understanding of ICT and contextual factors in different countries could have an impact on the integration of ICT in higher education [12]. A comparative study [22] shows that university students in China and the USA reported some similarities in preferred teaching styles. Both groups of students reported that they like creativity and collaborative work and dislike norm-conforming teaching styles and the lack of communication with teachers. Usage of ICT could improve that communication and learning processes.

Takahashi et al. [17] found that university students in Japan and China assume that Internet usage is linked to different ways of communication, changes in intercultural interaction and social changes. Japanese students use virtual communication through the Internet for developing long-term social networks, while Chinese students use the Internet mainly for building new social networks. Communication courses can help students to solve possible problems in communication caused by different ethnic backgrounds, as concluded by [7].

Previous research and goals of present study

This multi-national comparative research was started as a bilateral case study of a sample of American and Croatian students. In previous research, the differences and similarities of effective learning environment components were explored [20]. After that, similarities and differences in self-efficacy between American and Croatian students were examined and interpreted [21].

The overall objective of this present research is to explore the importance of different components of an effective learning environment related to ICT, university library resources and communication skills for university students in different countries. The specific objective is to find similarities and differences in perceptions of American, Asian and European students related to those variables (ICT usage, university library resources and communication skills development).

Methodology

1.3 Measurement

The Effective Learning Environment (ELE) survey [13] contained 55 items divided into four parts 1. Demographics (10 items); 2. Components of effective learning environment - ELE (28 items); 3. Self-efficacy as a factor of effective learning environment (10 items reprinted from Schwarzer & Jerusalem, M, 1995 in [13]; and 4. Background (7 items). The first and second parts of the ELE survey are evaluated and interpreted in this research. Part 2 (Components of effective learning environment) is designed as a 5-point Likert scale. Estimates are from "1 = not important at all" to "5 = very important". The alpha coefficient of reliability (α) for Part 2 is 0.871 and it is sufficient for data analysis [20].

1.4 Respondents

The research was conducted among students at six different universities – three European, two Asian and one American university. The core sample was 331 student at the University of Shkodra `Luigj Gurakuqi` in Shkoder, Albania (51% male and 49% female), 84 students at Karl-Franzens University in Graz, Austria (39% male and 61% female), 150 students at Northwest University, in Xi'An, China (58% male and 42% female), 39 students at Keio University in Yokohama, Japan (78% male and 22% female), 126 students at the University of Zagreb, Faculty of Organization and

Informatics (FOI) in Varaždin, Croatia (67% male and 33% female) and 255 students at the University of Cincinnati/Center for Access and Transition (CAT) in Cincinnati, USA (53% male and 46% female).

Results and interpretation

1.5 Demographic characteristic of students / respondents

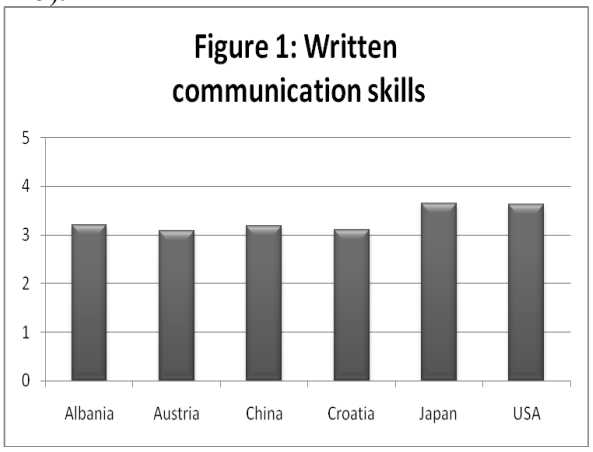
Most of the Albanian, Croatian and American students are between the ages of 18 and 21 (98% at the FOI of all respondents, with 95% at the CAT and 90% at the University of Shkoder, Albania). Among Austrian students there is almost an equal number of those between 18 and 21 (52%) and between 22 and 30 (48%). In the sample of Japanese respondents, there are more than half of the students between the ages of 22 to 30 (68%), with the others being younger (32%). Among Chinese students, there is an equal number of the students between 18 and 22 (32%) and those between 22 and 30 (36%), but there is also a significant number of students older than 30 (33%). Within all of the other samples, the number of students older than 30 is negligible.

According to the answers to the question whether students work and earn some income while they study at the university, the participants can be divided into two main groups. Most of the Croatian (86%), Albanian (82%) and Chinese (77%) students do not work at all while at college, some of them work from between 1 and 10 hours a week (12% Chinese, 12% Albanian and 10% Croatian), and only a minority of them works more than 10 hours a week. On the other hand, only less than half Austrian (49%), Japanese (45%) and American (42%) students do not work at all while they study. Most of the Japanese (43%) and Austrian (32%) students work from 1 to 10 hours a week, and in the USA there is a significant number of students working from 11 to 20 hours a week (28%), and some students even work more than 20 hours a week (20%).

1.6 Interpretation of survey results

Some items of the ELE survey, Part 2 – Effective learning environment [12], are analyzed and interpreted in the present study. Different elements of students' information literacy are explored and interrelated. The emphasis of this study is on the students' perceptions of computers and library resources, as well as their observations of the importance of basic communication skill development. There are some possible limitations in interpreting results related to gender and age and the different number of respondents in core samples.

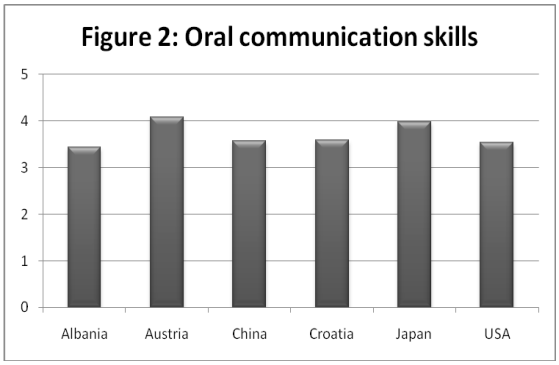
Some results are presented in the following figures. Figure 1 shows the students' answers to the question: "Is it important, or would it be important, for your successful learning to take a Composition class that will improve your written communication skills?" The highest assessment of importance is registered with Japanese (M=3.65, sd=0.92) and American (M=3.62, sd=1.08) students. There is an approximately equal importance attributed to written communication skills by Albanian (M=3.20, sd=1.38) and Chinese (M=3.19, sd=1.11) students, whereas students in Croatia (M=3.10, sd=1.07) and Austria (M=3.07, sd=1.12) consider this ELE component less important for their successful learning than their international peers. However, the differences among the groups are not statistically significant according to the analysis of variance / one way ANOVA (F=2.461, p>0.05, degree of freedom n'=5).



Legend: Access X: different countries; Access Y = mean values (M) of estimates

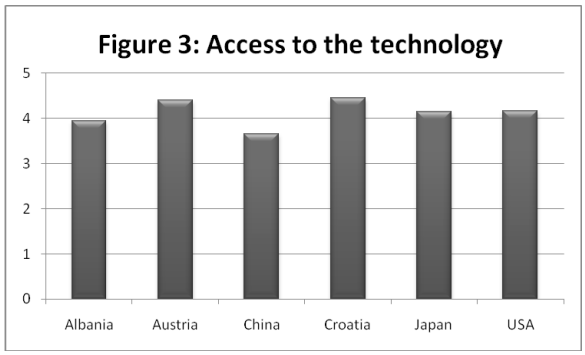
The students were asked about the importance of the oral communication skills for their successful learning. Answers to this question are shown in Figure 2. If we compare the students' perceptions of the importance of written and oral communication skills, it is apparent that students consider their oral communication skills more important than written communication skills. The highest assessments of the importance of this ELE factor comes from Austrian (M=4.08, sd=0.85) and Japanese (M=3.98, sd=0.95) students, followed by Croatian (M=3.59, sd=1.02), Chinese (M=3.57, sd=1.17), American (M=3.54, sd=1.15), and lastly Albanian (M=3.43, sd=1.33) students. The differences between groups are not statistically significant according to the ANOVA (F=5.207, p>0.05, degree of freedom n'=5).

.



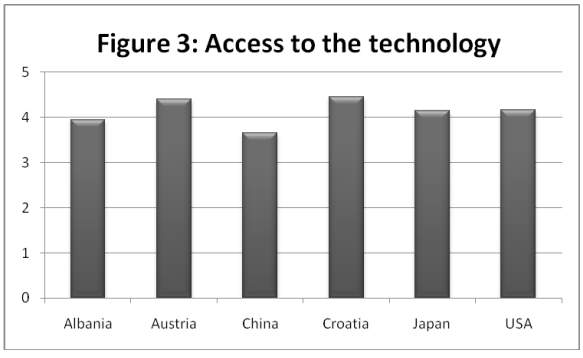
Legend: Access X: different countries; Access Y = mean values (M) of estimates

Figure 3 shows results obtained from the question: "Is it important for your successful learning to have access to the technology that you feel will help you succeed in your classes?" Access to the adequate technology is recognised as an important factor of successful learning among all the nationalities. Ranks are as follows: Chinese students consider this factor less important than all the other groups (M=3.65, sd=1.16). Croatian (M=4.44, sd=0.72) and Austrian students (M=4.40, sd=0.96) consider this factor more important for success in their classes than their American (M=4.17, sd=0.91), Japanese (M=4.15, sd=0.83), and Albanian (M=3.95, sd=1.3) peers. The differences between Albanian, Austrian, Chinese, Croatian, Japanese and American groups of students are not statistically significant according to the analysis of variance (F=2.166, p>0.05, degree of freedom n'=5).



Legend: Access X: different countries; Access Y = mean values (M) of estimates

As Figure 4 shows, access to the library resources is most important for Japanese students (M=4.35, sd=0.7) and the least important for Albanian students (M=3.91, sd=1.21). Answers provided by other nationalities to the question "Is it important for your successful learning to have access to the library resources that you feel will help you succeed in your classes?" are mostly equal, but Chinese (M=4.18, sd=1.0) and Austrian (M=4.15, sd=0.98) students consider it slightly more important than American (M=4.12, sd=1.01) and Croatian peers (M=4.11, sd=0.94). From the results presented in Figure 4, it can be perceived that among the six student samples from three continents, there are no statistically significant differences between the assessment of the importance for access to library resources. All students consider it important or very important (F=0.965, p>0.05, degree of freedom n'=5).



Legend: Access X: different countries; Access Y = mean values (M) of estimates

Students from six different universities on three continents reported that implementation of ICT, library facilities and communication skills development are very important parts of higher education. All students' assessments are in the positive part of a 5-point Likert scale (most of them averaging around 4 or higher), which means "important" or "very important".

Some gender differences have been found between male and female understanding of the importance of ELE factors. For example, Croatian female students rank importance of effective learning environment higher than their male colleagues [20].

Conclusion

Students from six different countries reported that usage of ICT is a very important part of their education. They think that development of oral and written communication skills is related to their successful learning. Library facilities provided by universities are also perceived by students as important factor for successful learning.

Results show that in general there are no significant differences in students' assessments of the importance of oral and written communication skills development. Differences in student's assessments of the importance of ICT and library access in different countries across three continents are small, but not statistically significant. This can be that, in spite of cultural differences, those variables are very important for successful learning among all students. Development of written and oral communication skills has to be the first and an important step in their education, as well as development of intercultural communication competence [7]. Results confirmed some previous research: for example, computer self-efficacy and computer attitudes are important parts of education [14], as a good library services [4] and good understanding of ICT in general [3]. Courses focussing on the improvement of communication skills and information literacy, particularly of computer and library literacy, could be a good start in the freshmen experience.

References

[1] Appatova, V., Prats, H.J. (2007). Effective academic environment for under-prepared college/university learners: listen to student voices. Paper presented at the 16th EAN Annual Conference "Access to Success: The Student Experience from Pre-Entry to Employment", Galway, Ireland, 2007. A vailable at http://www.ean-edu.org/about/victoria_appatova.ppt (Accessed 15th February 2008)

[2] Ferguson, B. (2005). Information Literacy: A Primer for Teachers, Librarians, and other Informed People, A FreEbook, http://bibliotech.us/pdfs/InfoLit.pdf (Assessed 16 t April 2010)

[3] Gerjets, P.H., Hesse, F.W. (2004). When are powerful learning environments effective? The role of learner activities and of students' conceptions of educational technology. International Journal of Educational Research, 41, 6, 2004, 445-465

[4] Jiao, S., Zhuo, F., Zhou, L., Zhou, X. (2009) Chinese academic libraries from the perspective of i nternational students studying in China. The International Information & Library Review, 41, 1, 1-11

[5] Kisla, T., Arikan, Y.D., Sarsar, F. (2009). The investigation of the usage of ICT in university lecturers' courses. Procedia - Social and Behavioral Sciences, 1, 1, 2009, 502-507

[6] Li, W. (2007). Family background, financial constraints and higher education attendance in China. Economics of Education Review, 26, I6, 724-734

[7] Mak, S.S., Buckingham, K. (2007). Beyond communication courses: Are there benefits in adding skills-based ExcelL™ sociocultural training? International Journal of Intercultural Relations, 31, 3, 277-291

[8] Mcilroy, D., Sadler, C., Boojawon, N. (2007). Computer phobia and computer self-efficacy: their association with undergraduates' use of university

computer facilities. Computers in Human Behavior, 23, 3, 1285-1299

[9] National Forum of International Literacy (http://www.infolit.org/) (Assessed Apr 16 th 2010)

[10] Pearson. J. (2006). Investigating ICT using problem-based learning in face-to-face and online learning environments. Computers & Education, 47, 1, 56-73

[11] Paechter, M., Maier, B., Macher, D. (2010). Students' expectations of, and experiences in e-learning: Their relation to learning achievements and course satisfaction. Computers & Education, 54, 1, 2010, 222-229

[12] Pelgrum, W.J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. Computers & Education, 37, 2, 163-178

[13] Prats, H.J., & Appatova, V. (2008). Framing a University Access Program for Under-prepared Students. In: Ferrier, F. & Heagney, M.: Higher Education in Diverse Communities - Global Perspectives Local Initiatives. European Access Network, London, U.K. in corporation with Masaryk University Press (120-126).

[14] Sang, G., Valcke, M., van Braak, J., Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviours with educational technology. Computers & Education, 54, 1, 2010, 103-112

[15] Sánchez-Franco, M.J.S., Martínez-López, F.J., Martín-Velicia, F.A. (2009). Exploring the impact of individualism and uncertainty avoidance in Web-based electronic learning: An empirical analysis in European higher education, Computers & Education, 52, 3, 588-598

[16] Su, K.D. (2008). An integrated science course designed with information communication technologies to enhance university students' learning performance. Computers & Education, 51, 3, 1365-1374

[17] Takahashi, C., Yamagishi, T., Liu, T.J., Wang, F., Lin, Y., Yu, S. (2008). The intercultural trust paradigm: Studying joint cultural interaction and social exchange in real time over the Internet. International Journal of Intercultural Relations, 32, 3, 215-228

[18] Tang, L.T. Austin, M.J. (2009). Students' perceptions of teaching technologies, application of technologies, and academic performance. Computers & Education, 53, 4, 1241-1255

[19] Verhoeven, J.C., Heerwegh, D., De Wit, K. (2010). Information and communication technologies in the life of university freshmen: An analysis of change. Computers & Education, 55, 1, 53-66

[20] Vidaček-Hainš, V., Appatova, V. & Prats, H. (2008). Components of effective academic learning environment: Case studies of Croatian and American students. Proceedings of the 19th Central European International Conference on Information and Intelligent Systems, Varazdin, HR, 137-144.

[21] Vidaček-Hainš, V., Prats, H. & Appatova, V. (2010). Self-efficacy and components of effective learning environment in higher education: Comparison of Croatian and American students. Journal of Information and Communication Technology, *in print*.

[22] Zhang, L. (2006). Preferred teaching styles and modes of thinking among university students in mainland China. Thinking Skills and Creativity, 1, 2, 95-107