

An examination of students' attitudes and preparedness for the introduction of ICT-enabled learning at university

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Abstract—The article presents research results relating to the attitudes of students' towards a wider use of ICT in the education process (e-learning/blended learning). The analyses were conducted against the backdrop of the students' subjective assessment of their general computer aptitude as well as their access to and use of ICT. Results prove that students' opinions on the wider use of ICT in the learning process was influenced by a subjective assessment of their general computer skills. That level was in turn determined by factors including study specialization as well as socio-demographic characteristics of the respondents, such as gender, place of residence and age. Access to a computer/Internet had some influence upon familiarity with given applications and online activities. Research results confirm the presumption that students with a higher appraisal of their competence were more positively inclined towards a wider use of ICT than those with lower levels of competence.

I. INTRODUCTION

THE traditional context of learning is experiencing a radical change. Teaching and learning are no longer restricted to traditional classrooms [1]. Teaching with the use of computers and computer applications is becoming ever more popular. Electronic learning (e-learning), referring to the use of electronic devices for learning, including the delivery of content via electronic media such as Internet, audio or video, satellite broadcast, interactive TV, CD-ROM, and so on, has become one of the most significant developments in the information systems industry [2]. The rapid expansion of the Internet as a delivery platform, combined with the trends towards location-independent education and individualization, has motivated universities to invest their resources on developing online programs [3].

Blended learning on the other hand, refers to an integrated environment, which combines the advantages of e-learning and traditional classroom teaching [4]. Generally, blended learning means any combination of learning delivery methods, including most often face-to-face instruction with asynchronous and/or synchronous computer technologies [5]. Blended learning – in its simplest form, the thoughtful integration of online and face-to-face-instruction [6] is being used with increased frequency around the world [7]. Thousands of corporate training programs, institutions of higher education schools participate in blended learning [8].

Although *e-learning* environments are popular, there is minimal research on instructors' and learners' attitudes toward these kinds of learning environments [2]. Usefulness

and ease of use have proved to be key determinants of the acceptance and usage of *e-learning*. On the contrary, little is known about students' perceptions in a blended learning setting [9]. During the recent years, a significant volume of research on the effective use and integration of Information and Communication Technologies (ICT) in education practices is observed. The main feature that differentiates the *e-learning* systems from the traditional learning environments is the degree of technology usage and the gradual shift of control and responsibility of the learning process to the learners, giving them the opportunity to learn anytime, anywhere. This shift of control seems to positively influence the learning effectiveness of learners [10]. Other findings [11] suggest that computer self-efficacy, among others, significantly affect performance expectations. Interaction has a significant effect on learning climate.

Many researchers have tried to evaluate the role of technology in the learning process with much emphasis being placed on the components of the learning systems [12]. Davis and Wong [13] pointed out that important factors having paramount influence on participation and engagement with a learning structure could be associated with their acceptance and affective responses towards the system. Others have used a reasoning quite similar to the technology acceptance model approach while investigating this phenomenon. Shu-Sheng Liaw et al. states that behavioral intention to use e-learning is influenced by perceived usefulness and self-efficacy [14] and further found that trainers were more positively inclined to use *e-learning* systems.

II. DATA AND METHODS

The main objective of the study was an investigation into the attitudes of students towards a wider use of Information and Communication Technologies (ICT) in the process of delivering education (e-learning and blended learning) at a higher education institution. In accordance with the belief that the attitude of a student towards ICT enabled learning, in some way is influenced by their general aptitude in the area of using computer tools, the results were presented on the backdrop of their subjective judgment of their general computer aptitude. In addition observations were made into the possible influence/role that Internet access that students possess (and to computers as such) on the student's approach towards the integration of ICT's in their education process.

This article presents the results of surveys conducted among students of selected faculties of the University of Rzeszow. The studies were carried out in the 2011/12 academic year, among a random sample of 420 respondents.

Opinions of the respondents were presented against the background of socio-demographic variables, such as age, place of residence (size of population) and gender. Since in the researchers' opinion, study profile could also have an impact on the attitude of students to the matter under consideration, we decided to profile students according to the study specialization. These specializations were later grouped according to their common characteristics (by faculties). Empirical data was collected through direct surveys. The sample of students taken into consideration for this study was obtained through cluster sampling.

The following research hypotheses were tested:

- The level of general computer competence as well as the familiarity and ability to use certain computer applications by the students was influenced by a computer/Internet access
- The attitude of students towards the wider use of ICT was dependent upon the level of competence in using a computer
- The general level of computer skills was determined by factors such as, study specialization as well as socio-demographic characteristics of the respondents.

In order to verify those statements the Spearman's rank correlation analysis and the chi-square test of independence were applied. The strength of the relationships demonstrated with the use of test of independence was measured using Cramer's V coefficient of association. The Student's t-Test was employed to determine the incidence of statistical differences in the self-accessed competence levels of women and men.

III. CHARACTERISTICS OF THE RESEARCH SAMPLE

The sample population totaled 420 young people of whom 65.5% (275) were females while 34.5% (145) were males. 33.3% of the respondents were rural inhabitants while 66.7% resided in urban areas. A significant percentage of the respondents were third year (38.%) and second year (31.7%) students. Students of the first, fourth and fifth years constituted the remaining 30% of the study sample. The respondents were students in the fields of Administration, English Studies, Landscape Architecture, Polish Studies, Physiotherapy, Mathematics, Environmental Protection, Agriculture, Tourism and Recreation, Physical Education as well as Food Technology. The Administration and English Language Studies specializations each accounted for 14.3% i.e. per 60 students, while the remaining fields of studies each represented 7.1% of the sample i.e. per 30 students. More than half (55.2%) of the respondents were aged 21-22, while the over 23 and 19-20 age groups accounted for 29% and 15.7% respectively.

IV. EVALUATING RESPONDENTS' ICT USAGE

Assessing the use of ICT in learning and communication was undertaken through the identification of major sources of information, the main tools of communications used by responding students as well as place of Internet (computer) access. The most commonly used source of information by the respondents were the Internet (76%), television (11.7%), and the radio (7.9%). A meager 2.4% of respondents identified the print media as the most frequently used source of information. The results point to the dominant role of the Internet in sourcing for information by the respondents. This serves as a premise in favor of using this medium for knowledge acquisition by students.

Besides serving as a prominent source of information for the respondents, the Internet is also a means of personal communication. 6.7% of respondents use the electronic mail as the most common medium of communication. It is the third most frequently used communication tool after the mobile phone (72.4%) and personal contact (18.3%).

Other types of communication tools such as landline phones, traditional mail and others constituted a negligible proportion (2.6%) of responses. Over three-quarters of respondents accessed the Internet from their homes, while 9.3% at place of work and only 4.8% at the university. About 7.4% of respondents accessed the Internet from other places. Worthy of note, is the low number of students citing the university environment as a place where they can/do access the Internet. This might partly be due to the fact that at the time of the study, the wireless access system was under development and computer labs were not easily accessible to students for out of class activities.

V. ASSESSMENT OF COMPUTER SKILLS

The application of modern information and communications technologies in the learning process requires adequate levels of computer skills from both students and teachers. In order to establish the students' potential in the event of implementing online learning an evaluation of their subjectively perceived levels of computer skills were carried out using a measurement ranking scale of 1-10, where 1 indicates very weak level and 10 indicates very strong competence. Fig. 1 shows the distribution of responses regarding students' self-evaluation of their computer skills.

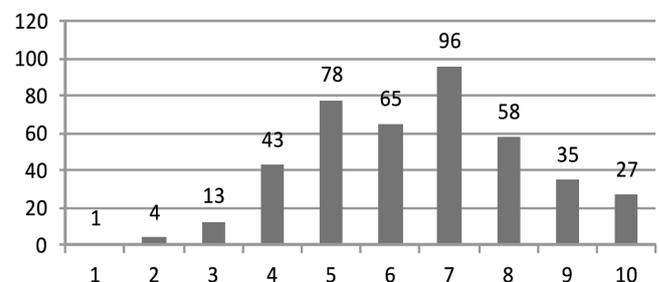


Fig.1 Overall rating of students computer skills.

The most often recorded value of self-assessment was at the level of 7 which was declared by almost 23% of the re-

spondents. More than 50% of the sample judged their competence at a level of 7 and above which gives a clear indication that the average level of competence among the students surveyed was quite satisfactory. The general computer level of the students was examined with respect to the students' gender (Table 1).

TABLE I.

DIFFERENCES IN THE LEVEL OF COMPUTER COMPETENCE BETWEEN MEN AND WOMEN - T-STUDENT TEST RESULTS

Var.	N (M)	N (W)	Avg. (M)	Avg. (W)	t	df	p
Skill Level	145	275	6.99	6.20	4.19	418	0.00

Through the use of t-Student's test it was proven that the average general competence level between men and women differed ($0,00 < 0,05$). The average competence level among males was higher than that for females. Many researches have tried to examine the relationship between the gender and the attitudes towards computers and their research have yielded varied results. Abouserie and Moss [15] or Kesici et al. [16] could not find a significant relationship between college students' attitudes towards computer-assisted learning and their gender while Whitley did record gender differences in computer-related attitudes and behavior [17]. The research results herein determine that there is significant difference between college students' computer attitudes based on gender in parallel with the findings from other studies which found a relationship between gender and computer use [18], [19]. A comprehensive review of the literature of gender differences in computer-related behavior reveals a myriad of conflicting results [20].

Besides, the subjective assessment of the respondents' overall level of computer competence, an analysis was made of the level of competence with respect to each of the following applications, i.e., Word, Excel, Power Point, E-mail software as well as the use of search engines fig. 2.

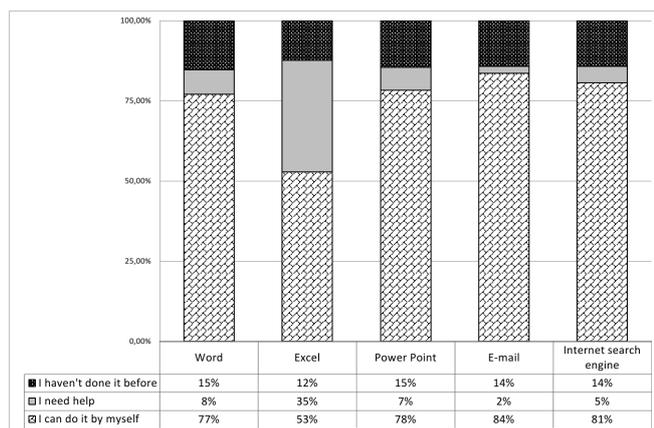


Fig. 2. Overall rating of students computer skills

The highest level of competence was observed in their ability to send e-mails with attachments. More than 83% respondents confirmed their ability to use electronic mails. A similar proportion of respondents (80.7%) confirmed they can independently use Internet search engines. This fact in-

dicates that the responding students are competent in using the Internet to seek information and also to communicate. From amongst the programs that constitute the Microsoft Office package, the highest skills level was observed in respect of Power Point. The level of independent use of Word was a little less while the lowest was with using Excel.

In order to ascertain the degree of use of modern technologies by students, the frequency of use of chosen tasks or programs was evaluated. Among the tasks and programs listed, students most often made use of theme forums, and e-mails in contacts with their teachers and lecturers. They also gained experience having been co-participants in video-conferencing. E-learning platforms and participation in online courses were, however, less popular. More than 47% of respondents never had work-related experience in e-learning environments, while over 12% had never heard of it. Almost 47% of respondents had never participated in Internet run courses and 6.2% had never heard of such. The data presented point to the relatively low popularity of e-learning tools in the learning-teaching process. This not only poses potential obstacles to the introduction of aspects of e-learning but also indicates tools that needs be popularized prior to the introduction of online teaching.

VI. LEVEL OF COMPUTER SKILLS AND AVAILABILITY OF INTERNET/COMPUTERS

In order to verify the hypothesis that overall level of computer competence is statistically significantly correlated with Internet (computer) availability the Spearman rank correlation analysis (with both variables presented as ranked scales) was applied. Results of this analysis confirmed that better Internet (computer) availability was associated with higher level of overall computer competence. This conclusion was reached based on the positively ranked correlation coefficient (0.08). However, the lack of statistical significance of the indicated correlation ($0.10 > 0.05$) makes its generalization beyond the tested sample impossible. That fact that the overall level of competence of students of Rzeszow University was associated with Internet (computer) accessibility could not be demonstrated. While there weren't grounds to reject the hypothesis of equivalence of the correlation coefficient being zero, it is the same correlation analysis that enables the identification of a statistically significant relationship between the level of skills with selected programs/tasks and the availability of the Internet (computer).

TABLE II

SPEARMAN CORRELATION FOR VARIABLES: PLACE OF INTERNET ACCESS AND LEVEL OF COMPUTER SKILLS WITH SELECTED PROGRAMS

Variables: place of Internet (comp.) access & skills level with programs	Spearman's rho	p
Word	0.2182*	0.000
Excel	0.0988*	0.043
Power Point	0.1996*	0.000
E-mail	0.2381*	0.000
Internet search engines	0.2721*	0.000
Word	0.2182*	0.000

* at level of 0.05.

Results translate to mean that as Internet/computer availability increased so did the level of skills in the use of the programs/tasks indicated. The strongest dependency was noted between Internet/computer availability and the use of Internet search engines (0.27). Computer availability, on the other hand, translates into competence in use of e-mail, Word, Power Point programs but with least impact on knowledge of Excel program. These results may suggest that students continue to use Internet/computer more for entertainment than for learning. The Spearman correlation analysis was also applied to test dependencies between frequency of use of selected programs/tasks and Internet/computer availability. The results are presented in table 3.

TABLE III.
SPEARMAN RANKED CORRELATION FOR VARIABLES: PLACE OF INTERNET ACCESS AND FREQUENCY OF USE OF SELECTED PROGRAMS

Variables: place of Internet (computer) access & frequency of use of selected programs	Spearman's rho	p
Internet-based course	0.1720*	0.0004
Discussions on theme forum	0.2923*	0.0000
Video-conference	0.2047*	0.0000
e-Learning platform	0.1442*	0.0031
Contact with teachers via e-mail	0.1051*	0.0314

* at 0.05 level

All the dependencies were positive and statistically significant. Internet/computer availability translated primarily into university students participating in discussions conducted on Internet forums, video-conferencing, Internet-based courses, working in e-learning environment as well as contact with tutors/lecturers via electronic mail.

VII. STUDENTS' OPINION ON THE USE OF ICT IN THE TEACHING PROCESS

One of the objectives of the study was to assess the attitude of students at the University, towards teaching achieved through the use of modern technologies. The implementation of such teaching could therefore be justified by the fact, that students perceive the benefits accruing to use of modern technology. While almost 54% of students wholly agree with the statement that ICT offers good access to necessary study materials, 41% admit that the Internet facilitates sharing of information and observations with people of similar interests, another 34.8% respondents concluded that audio-visual materials can improve the teaching process. While a wider use of ICT is supported by the fact that more than 20% of the respondents rejected the statement that e-learning is time-consuming, more than 18% claim that it is difficult finding specific information on websites and yet another over 17% of them claim that learning with the use of ICT has failed to meet expectations.

There were, amongst students, opinions which favored traditional teaching to teaching with the use of ICT. Many students still prefer to read printed texts – an opinion which over 44% of respondents agreed with and another 30% more or less are in support of. Almost 49% of respondents prefer

learning using traditional methods while for almost 46% finding specific information on website constitutes a difficulty. Half of the respondents have opinions that the implementation of such teaching forms requires the acquisition of upgraded computer skills. In addition, about 34% of respondents are of the opinion that teaching via the Internet is not as effective as teaching using traditional methods.

There were, among the positive correlations, statistically significant relationships between: the level of computer skills and the willingness to ask teachers/lecturers questions via ICT as well as between the first variable and the assessment of possible improvements to the learning process using ICT. It was, on this basis, concluded that the higher the level of the University students' computer skills, not only the greater their willingness to contact lecturers using modern tools but also the greater their conviction of the existence of potential possibilities for improvements using ICT.

Based on the negative, statistically significant correlation between levels of computer competence and the variable relating to preferences in reading printed texts as well as between the first and the opinion about difficulties in finding specific information on websites, it was concluded that the said difficulties were observed more by the University students, who rated their level of computer competence as weak.

VIII. OVERALL ASSESSMENT OF COMPUTER COMPETENCE AND CHARACTERISTICS OF RESPONDENTS

Another hypothesis that was verified was of the existence of relationship between overall level of computer competence and the characteristic features of respondents. The characteristic features tested were gender, place of abode, field of study and age of the respondents. The level of competence, initially measured as a ten-point scale was presented as three-point scale distinguishing three levels of computer competence i.e., very weak/weak, average, and good/very good. The procedure made it possible to examine the existence of relationships between the variables by using the Pearson's chi-square test of independence.

Since the level of probability test p turned out less than the assumed level of significance (0.05), the hypothesis of independence of variables was rejected. It was thus shown that the level was determined separately for each of the listed characteristic features of the respondents. The strongest correlation coefficient measured using the Cramer's V coefficient of association was noted between level of competence and field of study of respondents (0.24). Other dependencies displayed similar strength.

IX. ATTITUDES OF STUDENTS TOWARDS THE INTRODUCTION OF E-LEARNING AND THE USE OF COMPUTERS IN TEACHING

The last stage of the analysis was to test the attitudes of students towards the introduction of online teaching into the University's curriculum.

Over three-quarters of the respondents identified the opportunities offered by the implementation of e-learning.

Students confirmed that this form of teaching makes education acquisition more available for all including disabled persons or those from regions distant from the University. More than 60% of respondents saw the opportunity of taking courses within and outside the country through teaching via the Internet and conceded that such form of knowledge acquisition is attractive since it allows easier contact with teachers and thus making the learning process convenient due to the large availability of varied sources of information. The respondents, on the other hand, doubted if this form of teaching offers real opportunities for speedy response to teaching effects and if it actually ensures more effective and systematic teaching curriculum.

The introduction of elements of e-learning inherently involves the use of computers in the teaching-learning process. The tendency of students to use the computer in the learning process is illustrated in fig. 3.

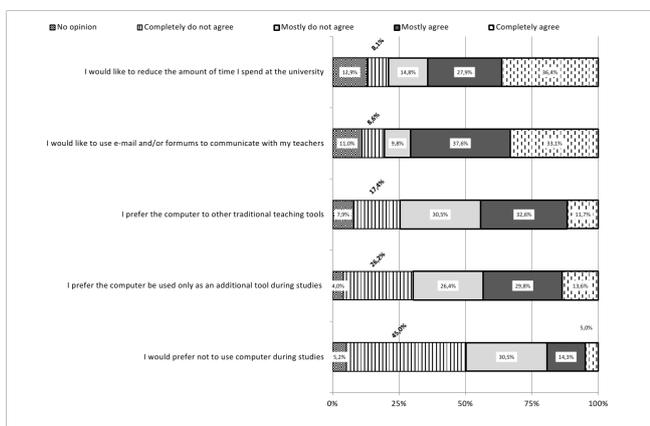


Fig. 3. Attitude of students towards the use of computer in teaching-learning process

More than 44% of respondents expressed their willingness to replace traditional teaching tools with computer aided solutions. Furthermore, over 26% of respondents disagreed with the statement that the computer is only an additional element in their course of study, thus to a certain extent, emphasizing the importance of this tool for students in their studies. Simultaneously, as many as 45% of them would not like to be deprived of the possibilities of carrying out part of their studies with the use of the computer. Students appear to acknowledge the time saving opportunity and other benefits offered through the introduction of Internet-based teaching and also confirm that this approach would facilitate easier contact with their teacher.

The obtained results concur with the literature [21] providing empirical evidence supporting the usefulness of e-mail as a promising aid to promote student cognitive growth pertaining to computer knowledge and skills. However, as Lee [22] succinctly warned, "Richness or leanness is not an inherent property of the electronic mail medium, but an emergent property of the interaction of the electronic mail with its organizational context." For e-mail to make a beneficial impact on education he states that to cultivate an online two-way communication, instant

feedback provided by recipients would be an important task all participants need to attend to. However Ruberg and Miller [23] pointed out that access to essential hardware and software need to be in place to ensure online communication among participants.

Among the hypotheses which were tested was the belief that students with better computer competence levels would be more inclined to embrace e-learning as an important aspect of their curriculum activities. This hypothesis was tested using the rank correlation analysis between the level of competency and students' opinions on the use of ICT in the education process. These results are presented in Table 4.

On the basis of the probability of the test values and the sign (negative) of coefficient of correlation it can be stated that there was a significant relationship between the judgment of computer competence and:

- the propensity to use a computer during studies (-0.098), as well as,
 - the inclination to use a computer only as an additional tool in the learning process (-0.160).
- Significantly disparate positive correlations were discovered between the competency level and:
- the tendency to rank computer assisted tuition above traditional methods (0.130) and
 - the readiness to use e-mail to communicate with instructors (0.084).

The results herein presented allow for the legitimate assumption of validity of the aforementioned hypotheses. Students declaring lower levels of competence were less inclined to use digital tools in the course of study as well as they seemed to underrate the value of ICT in their study activities.

TABLE IV.

SPEARMAN'S RANK CORRELATION FOR VARIABLES: ATTITUDE TOWARDS THE USE OF COMPUTER IN LEARNING PROCESS AND OVERALL LEVEL OF COMPUTER SKILLS

Variables: overall level of computer skills& opinion on using computer in teaching-learning process	Spearman's rho	p
I would not to use computer during studies	-0.0976*	0.045
I prefer the computer be used only as an additional tool during studies	-0.1597*	0.001
I prefer the computer to other traditional teaching tools	0.1301*	0.007
I would like to use e-mail and/or forums to communicate with my teachers	0.0835**	0.087
I would like to reduce the amount of time I spend at the university	-0.0452	0.355

* at 0.05 level; ** at 0.1 level.

X. CONCLUSIONS

For the vast majority of students the most prominent source of information appears to be the Internet while they predominantly use mobile phones for personal communication. The survey indicates that the majority of university students accessed the Internet from their homes. This gives the foundation to assume that a move towards the wider integration of information and communication technologies into the

curriculum should be a most natural succession for such a body of students. Consequently there's reason to assume that it is highly probable that the introduction of an e-learning/blended learning solution may yield favorable results. Furthermore most of the students declared manageable proficiency levels in their use of ICT thus further supporting the belief that they would be well equipped to employ such technologies in the course of study.

This corresponds with opinions from the literature [24] which reports that learner's attitudes towards technology and blended learning may have significant effects on the success of the ICT application in higher education.

Research results did not allow for the assumption that access to a computer influenced the level of students' competency but did show a positive effect on their familiarity and knowledge of certain computer applications like Word, Excel, PowerPoint. Students in possession of computers also seemed to be more acquainted with tasks like using search-engines as well as e-mail programs. A positive relationship was also noted between those who had access to a computer and their knowledge and use of e-learning and blended learning tools i.e. online courses, forums and e-mail.

Students' general competency was influenced by their study specializations, as well as gender, age and place of abode. Students were more willing to incorporate ICT into the repository of learning tools as subjective assessment of their computer competence improved.

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