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E-SKILLS ARE REALLY CRITICAL TO E-LEARNING SUCCESS?

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ABSTRACT

In the current literature there is emphasis that learners' ICT skills are critical to e-learning success (named e-skills in the context of this paper). Can this imply that more tech savvy students are best suited to get the top grades in e-learning? Or e-learning can help to close the gap between more tech savvy and less tech savvy students? In the context of this paper, the term "tech savvy" is applied to a user that operates well with information technology. The aim of this study was to discuss how the e-skills of health university students can influence their results in a blended-learning course on conducting research projects. The research was based on a case study conducted in a Portuguese private polytechnic school, with undergraduate health students which initiated their first year of higher education in 2007/2008. The data collection methods included the course's assessment ratings and a survey answered by the students at the end of the experiment. The findings suggested that, when the students have a minimum set of e-skills, the use of e-learning tools, such as lessons' screencasts and an online learning environment (based on a Moodle platform), can capitalize on those skills to level less tech savvy and more tech savvy students. The study contributes to our understanding that blended-learning seems to be the best modality of e-learning in order to increase e-skills among less tech savvy students.

KEYWORDS

E-skills; Electronic learning; e-learning; blended-learning; ICT skills; health higher education.

1. INTRODUCTION

Electronic-learning (e-learning) is becoming almost ubiquitous in every educational context, from primary school to higher education, from workplace learning to professional training. In certain cases, it seems to be like a magic formula that converts every course in a pleasant learning experience. However, there are several factors that need to be considered if we want to achieve a successful e-learning course, as perceived by students. These e-learning critical success factors have been thoroughly studied by the research community and the results published, often emphasize that students' ICT skills are critical to e-learning success. Student prior ICT experience such as having a computer at home and using the Internet on a daily basis is an example of such skills (named e-skills in the context of this paper).

The purpose of this paper is to discuss how the e-skills of health university students can influence their results in a blended-learning course on conducting research projects. In other words, are more tech savvy students best suited to get the best grades in e-learning? Or e-learning can help to close the gap between more tech savvy and less tech savvy students? In the context of this paper, the term "tech savvy" is applied to a user that is fluent operating (not developing) information technology. The analysis focused on undergraduate health students, which initiated their first year of higher education in the 2007/2008 academic year, from a Portuguese private polytechnic school.

This article starts by describing the critical success factors of e-learning, from a literature review, to highlight students' e-skills as one of them. Following, we introduce the case study that was conducted to verify the influence of learners' e-skills in the outcomes of higher education students enrolled in a blended-

learning course. Finally, we present the results that will positively confirm one of the following questions: "e-skills are really critical to e-learning success?" or "e-learning can help to close the gap between more tech savvy and less tech savvy students?".

2. E-LEARNING CRITICAL SUCCESS FACTORS

According to Rockart (1979), one of the first researchers to explore the concept, Critical Success Factor (CSF) is a business term for an area in which results, if they are satisfactory, will insure successful competitive performance for the organization or project it belongs to. This definition implies that CSFs (of a project, for instance) must be limited in number, they are the critical key areas that must be met for the project to achieve its goal (Huotari and Wilson, 2001).

In e-learning, defined as learning facilitated online through network technologies (Garrison and Anderson, 2003), there are several CSFs depending on the perspective used to analyze the subject. Shershneva and Olson (2005) organized a set of quality standards in the field of distance education around the main four education axis: learner, instructor, curriculum and context. Table 1 presents some of those CSFs, particularly the ones that have greater impact on students.

Table 1. CSFs of e-learning by education axis (Garrison and Anderson, 2003, p. 130)

Student/learner
Learner advised about skills, technology required for success
Learner has access to technical assistance
Learner questions/complaints addressed promptly
Etc.
Curriculum/programme
Clear objectives described
Requires learner to actively participate, think about material and respond
Plan for learner diversity (e.g. learning styles, non-native language speakers, gender, age)
Etc.
Faculty
Academically qualified persons participate fully in curriculum development and oversight
Technical assistance available to faculty
Etc.
Institutional/departmental context
Technical infrastructure adequate, reliable
Appropriate information provided to learner before enrolment
Builds sense of community among learners
Etc.

It is not surprising that the first item of Table 1 refers to students' e-skills. As a matter of fact, several researchers have stated that students' ICT skills are critical to e-learning success (O'Neill et al., 2004, Singh et al., 2005, Davies et al., 2004). Student prior ICT experience such as having a computer at home and using the Internet on a daily basis is an example of such e-skills.

However, in the actual context of higher education, the discussion should not be placed between the presence vs. the absence of students' e-skills, but in the extent of those skills, because practically all students have previous experience with ICT (McEuen, 2001). For instance, in Portugal by the end of 2007, 99% of all students were computer users and 97% were Internet users, placing Portugal in the 4th and 8th position, respectively, in the ranking of the 27 European Union countries (GTAESI, 2007).

Hence the reference to "more tech savvy" and "less tech savvy" students, instead of "have" and "have not" ICT experience. In addition, we already knew that the group of students which participated in this study had a minimum of ICT skills because that same group was part of a previous study's sample conducted to explore the relations between eLearning and solidarity (Jesus and Moreira, 2008).

3. RESEARCH METHODOLOGY

To explore the criticality of e-skills for the success of e-learning, we have conducted a case study during the first semester of the 2007/2008 academic year. According to Yin (2003), a case study is an empirical inquiry which investigates a specific phenomenon, in a specific group, in order to answer specific questions holistically.

One of the researchers of this paper is the professor of a health research course whose participants are first year students from the Instituto Politécnico de Saúde do Norte (IPSN, a Portuguese private higher education school; URL: http://www.cespu.pt/pt-PT/ensino/ensino_politecnico/). The course aims to prepare students from several educational areas—Nursing, Pathological Anatomy, Podiatry and Dental Prosthesis—to conduct research projects in their fields. With a conventional 2-hour lecture per week and a course management system (an online learning environment) to support the course during and between classes, the unit of Health Research takes place in a fully equipped classroom with personal computers and broadband Internet connection. In this case study participated only Nursing students (n=82), that were split into five groups so that each class had an average of 20 students.

The main objective of the case study was to assess if the e-learning tools contributed to a better learning experience for the health students. Specifically, we wanted to evaluate if the students' access to the lessons recorded in electronic media (a CD-Rom with screencasts) and to an online learning environment (based on a Moodle platform), allowed them a more complete learning experience, and therefore, better ratings in their final assessment. Because the e-learning tools were used as a supplement to traditional classes (and not as replacement), we are in a blended-learning situation (Shoniregun and Gray, 2003).

A screencast is a digital recording of computer screen output, including mouse movements and clicks. Also known as a video screen capture, screencasts can include audio narration to explain the process that is being documented by the screencast (Peterson, 2007). Due to the large size in bytes, the screencasts with the lessons were distributed to the students in a CD-Rom, instead of being delivered over the Internet.

According to Cole and Foster (2005), Moodle is an open source course management system (CMS) used by all kinds of schools and training companies to add web technology to their courses. Moodle is currently used by more than 2,000 educational organizations around the world to deliver online courses and to supplement traditional face-to-face courses. Moodle is available for free on the Web (http://moodle.org), so anyone can download and install it. The Moodle platform of our experiment included all the other resources besides the screencasts, both static and interactive learning activities.

To conduct the case study, each set of 20 students was placed in one of two groups (see Figure 1).

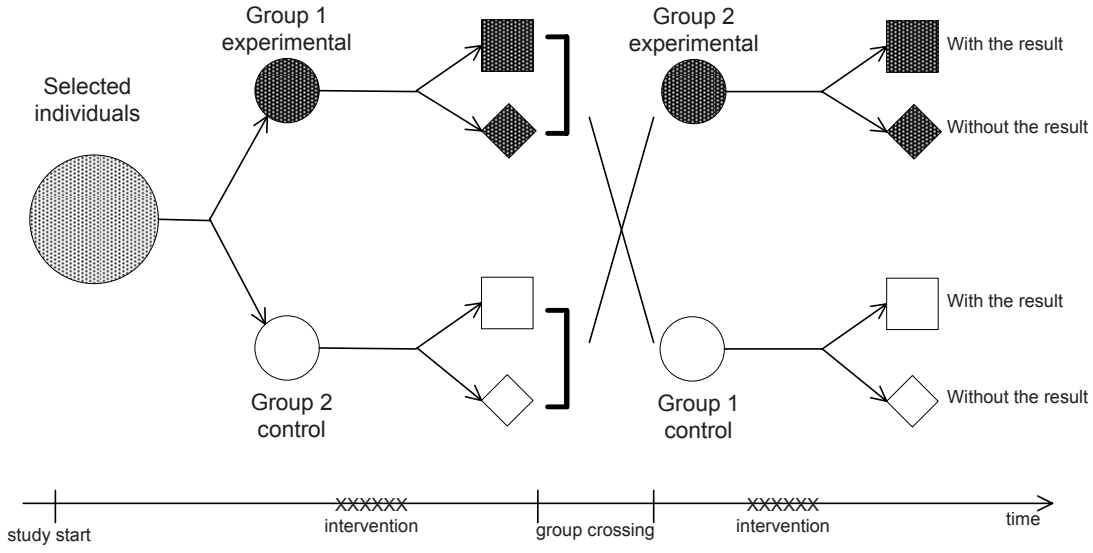

Figure 1. Study design: experimental cross group study with pre and post-test

In the first half of the semester, Group 1 had the classes in the blended-learning configuration, and Group 2 only had traditional classes. In the second half of the semester, the groups exchanged parts, Group 2 had the classes in the blended-learning configuration, and Group 1 only had traditional classes.

There were three assessment moments during the experiment, in which students completed a set of steps of practical nature in order to conduct a fictitious research project. The first test took place in the second class and it was a pre-test in order to get a reference that allowed later, measuring the evolution in the students' ratings. In the eighth class (in the middle of the semester) was held the first post-test to assess the results of the intervention. That is, to see if there was any difference in the ratings, between the students who had access to e-learning tools and those who did not. After the first post-test the groups were crossed. Finally, in the last class of the semester took place the second post-test, not only to compare the ratings of both groups, but also to assess the ratings evolution between the first and second post-tests (and also compare these results with those of the pre-test).

3.1 Study Groups' Formation

During the course of the experiment we noticed another area of interest that deserves attention: the relations between e-skills and e-learning. In other words, are more tech savvy students best suited to get the best grades in e-learning? Or e-learning can help to close the gap between more tech savvy and less tech savvy students? To conduct this analysis the students were divided into two groups, based in their responses to a survey that was answered in the end of the semester. So, the more tech savvy students were those who met, at the same time, the following four conditions:

- Computer use on a daily basis, or at least more than 3 days / week;
- Internet use on a daily basis, or at least more than 3 days / week;
- E-mail use on a daily basis, or at least more than 3 days / week;
- Chat (e.g. Messenger, mIRC) use on a daily basis, or at least more than 3 days / week.

All other students that failed to comply one of the above conditions were considered less tech savvy. As a result of this division, from the 82 total students, 48 were considered more tech savvy, and the remaining 34 were considered less tech savvy.

4. FINDINGS

The survey in which this study was based had many questions but this section only presents the ones that proved to have significant statistical differences—at 95% confidence level—between the two groups of students (more tech savvy vs. less tech savvy).

4.1 Tech Savvy Groups' Characterization

Besides the mentioned four criteria used to divide more tech savvy from less tech savvy students, some other factors are presented to better characterize each set of students, corroborating the division made.

Only in the less tech savvy group there were students without an e-mail address: 1 invoking dislike and 3 stating that have never felt the need. Only in this group too, there were students—38%—that do not use Internet relay chat. And, once again, the reasons invoked for not using it, show that these students do not like 'technology' (e.g. "I don't like to spend much time at the computer.").

With respect to discussion forums, the main reason invoked by more tech savvy students for not using them was "never felt the need"; while the majority of less tech savvy students stated that they ignored its existence.

More tech savvy students started earlier to use the Internet, e-mail and chat, as we can see in Table 2.

Table 2. Years of technology use (5% trimmed mean)

How long ago the student uses the…	Tech savvy?	
	more	less
…Internet?	5,88	4,52
…e-mail?	4,58	3,11
…chat?	4,48	2,81

In the group of more tech savvy students the majority has laptop (71%), while in the group of less tech savvy students only a minority has laptop (47%). It is also in this last group that one third or more of students do not have Internet access at home and those who have, it is not a broadband connection.

4.2 Use of e-Learning Tools by Tech Savvy Groups

This section presents the reaction that the use of e-learning tools provoked on both groups of students, and one again, those reactions support the division that was made.

As we can see in Figure 2, in the group of less tech savvy students the majority did get confused in the first time they accessed the screencasts CD-Rom (54%), and the course's website (64%). On the other hand, in the group of more tech savvy students only one fourth of students experienced the same kind of confusion, showing that this type of students are much more familiar with these tools than less tech savvy students. Even after the first impact, there were a significant number of less tech savvy students—more than one third—that felt uncomfortable using the course's e-learning tools, while in the group of more tech savvy students almost everyone felt comfortable exploring those tools after that first impact.

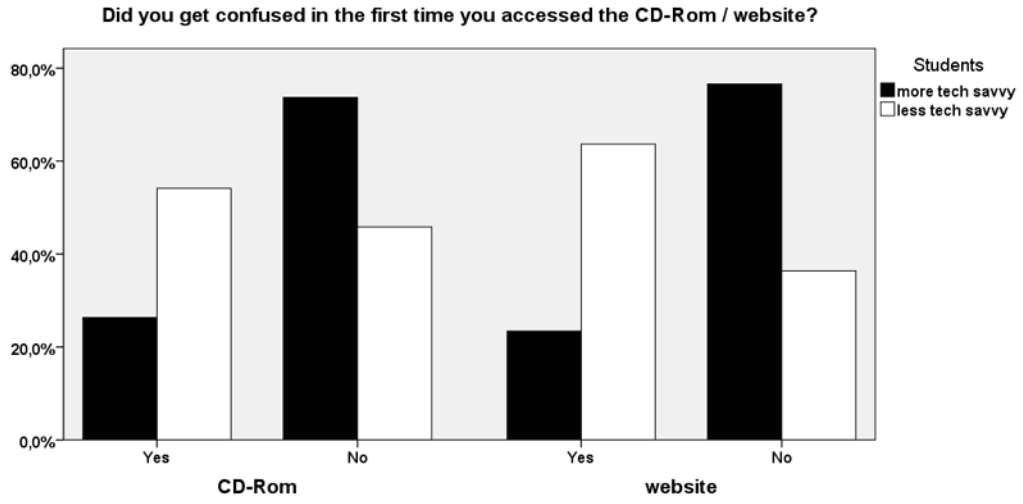

Figure 2. Difficulties in the first time access to the courses' e-learning tools

The next analysis focuses on three survey questions that were responded in a 5-point scale (1 to 5), where 1 means "totally disagree" and 5 means "totally agree".

When asked to rate the agreement with the following phrase: "The CD allowed me to watch the screencasts several times (as many as needed).", only 22% of less tech savvy students totally agreed with the sentence, while in the more tech savvy group that percentage rose up to 47% of the students. This shows the interest that more tech savvy students have in this type of learning content. It is easy for them to use these resources, which is not the case of less tech savvy students (at least so easily).

When asked to rate the agreement with the following phrase: "When accessing the website, I simply felt that it was not the same thing as being in a classroom with the professor lecturing 'live'.", only 36% of more tech savvy students agreed with the sentence, while in the less tech savvy group that percentage rose up to 61% of the students. This shows that less tech savvy students have a more closed attitude towards this type of

learning content. They prefer traditional classes (as we shall see in Table 3) which is not so evident in the case of more tech savvy students.

When asked to rate the agreement with the following phrase: "The need of an Internet connection in order to access the website was a limitation to me.", only 4% of more tech savvy students agreed—either partially or totally—with the sentence, while in the less tech savvy group that percentage rose up to 48% of the students. On the other hand, only 21% of less tech savvy students totally disagreed with the sentence, while in the more tech savvy group that percentage rose up to 64% of the students. This shows the hitches that less tech savvy students had to access the course's Moodle platform outside school. As a matter of fact, nearly half of less tech savvy students stated that they have never accessed the website outside school, while in the more tech savvy group that percentage dropped to 17% of the students.

Table 3 shows that less tech savvy students attended to more classes than more tech savvy students. On the other hand, this last group of students accessed more from home, to the course's Moodle platform than the less tech savvy counterpart—the alternatives were "in the classroom", "in school" and "from home/outside school"—because, as we saw before, less tech savvy students have some difficulty to access the Internet outside school.

Table 3. Student's participation in classes and online platform (5% trimmed mean)

How many total hours the student…	Tech savvy?	
	more	less
…attended the classes?	18,41	20,20
…accessed to Moodle outside school?	1,17	0,59

4.3 Tech Savvy Groups' Ratings

This section presents the grades that each group of students has achieved in the three assessment moments during the experiment. But before that, it is important to recall the information given in the Research Methodology section.

In the beginning of the experiment the total class of students was divided in two groups, as illustrated by Figure 1. Excluding the students that have missed one or more tests, Group 1 was composed by 30 students and Group 2 was composed by 49 students.

In the end of the experiment, when applying the tech savvy criteria, two more groups of students were created: more tech savvy and less tech savvy.

At this point, it is relevant to know that Group 1 was formed by 19 more tech savvy students and 11 less tech savvy students; while Group 2 was formed by 27 more tech savvy students and 22 less tech savvy students. This happened by accident because when the two original groups were formed we did not know yet the technological profile of the students.

This division means that in the first half of the semester, only one third—11 in 33—of less tech savvy students had access to the courses' e-learning tools, while in the second half of the semester, the remaining 22 less tech savvy students had access to those tools. But let us see the students' grades presented in Table 4, knowing that there were three students—2 more tech savvy and 1 less tech savvy—that have missed one or more of the three tests.

Table 4. Students' grades (5% trimmed mean)

	Tech savvy?	
	more	less
Pre-test	7,48	6,63
1st post-test	13,38	12,43
2nd post-test	**15,67**	**15,34**

Table 4 shows that the grades difference between more tech savvy and less tech savvy students tends to decrease over time: 0.85 in the pre-test, 0.95 in the 1st post-test, and 0.33 in the 2nd post-test. That is, less tech savvy students tend to recover the technological disadvantage they had in the beginning, as they interact with e-learning tools. That is why the difference increases from the pre-test to the 1st post-test because most of less tech savvy students—22 vs. 11—are in Group 2, which only had access to e-learning tools after the 1st post-test. This fact is confirmed in Table 5 where the smallest grades difference—near zero—occurs in the 2nd

post-test of Group 2. That is, when all students—including the majority of less tech savvy—already had used the courses' e-learning tools, the differences vanished.

Table 5. Students' grades by group (5% trimmed mean)

Test	Group	Tech savvy?	
		more	less
Pre	1	6,87	5,90
	2	7,87	6,99
1st post	1	12,20	10,44
	2	14,14	13,50
2nd post	1	16,00	15,22
	2	**15,437**	**15,431**

5. CONCLUSION

This case study was not initially set up to measure the criticality of e-skills for the success of e-learning. The main objective of the case study was to assess if the e-learning tools contributed to a better learning experience for the health students. However, during the course of the experiment we noticed that less tech savvy students tended to accomplish the same success levels than more tech savvy students, in the unit of Health Research. In other words, and despite the lower grades that the less tech savvy group obtained in the beginning of the course, the e-learning tools used by the students helped to close the gap between more tech savvy and less tech savvy students.

This finding brings a new perspective to the field of e-learning. Usually, the research community states that e-skills are critical to e-learning success. That is, a student with no prior ICT experience—such as having a computer at home and using the Internet on a daily basis—hardly ever will be successful in e-learning. This study, although not questioning that assumption, found out that the use of e-learning tools can capitalize on a minimum set of e-skills to level less tech savvy and more tech savvy students.

We have evidence that the improvement in the grades of less tech savvy students, between the beginning and the end of the experiment, is partially due to the use of e-learning tools, but there were other factors that may have contributed to that result. The first one is that the course's curriculum—learn how to conduct research projects in the health field—indirectly contributes to the increase of e-skills. The second one is that the course took place in a blended-learning configuration. So, traditional classes (and not only e-learning tools) may also have contributed to the increased e-skills of less tech savvy students. The results of this study are applicable only to the sample of students that participated in the experiment.

After analyzing the advantages and limitations of the study conducted, we may conclude that blended-learning seems to be the best modality of e-learning in order to increase e-skills among less tech savvy students. And that is because the sharing of written resources is best suited for online environments, but the sharing of some "how to do" practices (skills) is best suited to be conducted in face-to-face environments. So, further research is necessary.

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