EFFECTIVENESS OF AN E-LEARNING SYSTEM AND STUDENTS' PERCEIVED SATISFACTION IN A PUBLIC ADMINISTRATION PROGRAMME USING THE MOODLE E-LEARNING PLATFORM

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Abstract

The use of e-learning techniques in higher education is becoming ever more frequent. In some institutions, e-learning has completely replaced the traditional teaching methods, while in others it supplements classical courses. The paper presents a study, conducted in a member institution of the University of Ljubljana, providing public administration programmes. We analysed the relationship between proportion of the course implemented in Moodle e-learning platform and students' effectiveness and satisfaction. The empirical findings reveal positive correlation for both elements. The results can help the decision makers to learn more about how to enhance students' success and satisfaction using an e-learning platform.

Introduction

E-learning is becoming increasingly interesting for society and educational institutions because it supports the concept of lifelong learning and because knowledge is becoming more and more important. This increases the demand for various educational forms and means. Different education programs worldwide cater to the increased demand and offer new forms of education that are frequently supported by information-communication technology (ICT) (Sulčič & Lesjak, 2009). Moreover, technological advances have revolutionized teaching and learning processes (Aristovnik, 2013). Fry (2001), for instance, notes that the emergence of new technologies, the rapid expiration of knowledge and training, the necessity of just-in-time information delivery, and the need for more cost-effective teaching methods have transformed the teaching-learning practices.

Since e-learning has been an important and ever more frequently used teaching technique in the past decades, there are also many opinions as well as studies on its impact on students' performance. Delivering instructions that can produce equal or even better outcomes than face-to-face learning systems is one of the main goals of introducing ICT into study process (Carr, 2000; Saba, 2012). But besides many advantages of this type of the study (e.g., in Cole, 2000, Novo-Corti, Varela-Candamio, & Ramil-Diaz, 2013), there are also many disadvantages, which can decrease the positive impact of modern ICT tools on students' performance (e.g., in Wang et al., 2003). Moreover, in the e-learning process there are also many specific factors involved (Chien, 2012; Frydrychova Klimova & Poulova, 2013; Haverila & Barkhi, 2009; Kim & Kim, 2013; Ozkan & Koseler, 2009; Park & Choi, 2009; Saba, 2012;

Upadhyaya & Mallik, 2013) that are not directly connected with the ICT but importantly influence the students' effectiveness (Lopez-Perez, Perez-Lopez, & Rodriguez-Ariza, 2011), sometimes also in a negative way (Berge & Huang, 2004; Frankola, 2001; Willging & Johnson, 2004).

When making the decisions regarding the introduction of blended learning (Friesen, 2012) and on the use of a specific e-learning platform, it is important to analyse the opinions of different stakeholders, involved in e-learning process, i.e., teachers (Boling, Hough, Krinsky, Saleem. & Stevens, 2012) and students (Ozkan & Koseler, 2009; Paechter, Maier, & Macher, 2010; Wu, Tennyson, & Hsia, 2010). The same is important also when making the improvements and deciding about any changes in the concept of e-learning.

The purpose of the paper, is firstly, to provide the answer to the question whether the introduction of e-learning system Moodle as a part of a teaching process in the public administration programs had an impact on students' effectiveness, measured as the average grade and the average number of admissions to the exams for each course. Secondly, we tried to find out how the introduction of e-learning system Moodle influenced the students' satisfaction with the specific aspects of course conduction (prompt study, the availability of relevant information). The two research questions were formulated as hypotheses:

H1: Higher proportion of implementation of a course in Moodle increases students' effectiveness.

H2: Higher proportion of implementation of a course in Moodle has a positive impact on students' satisfaction.

The paper continues with the presentation of the sample and of the data collected, followed by the description of the methodology and empirical results. The conclusion offers the findings, implications for research and practice, limitations and avenues for future research.

Data

Faculty of Administration (FA) is a part of the University of Ljubljana, Slovenia. FA educates students in the field of administrative science and develops this field through a variety of research. Study at the FA is interdisciplinary and includes administrative, legal, economic, as well as organizational and ICT courses. FA offers undergraduate study programs (1st cycle) − University Study Program in Public sector governance and Higher Education Professional Study Program in Administration, which last 3 years (six semesters). Both undergraduate study programs of the FA meet the requirements defined by the European Association for Public Administration Accreditation (EAPAA) high quality standards.

e-Learning at FA
The beginnings of e-learning at the FA are dating back to 2005, when we implemented a payable platform for e-learning, i.e., eCampus. After three years, the learning platform was replaced with open-source Moodle platform, mainly due to user-friendly environment and cost benefits. FA runs blended

learning, where traditional face-to-face teaching is combined with e-courses in Moodle.

In the beginning, implementation of e-course was based on a voluntary decision of teachers themselves. In the academic year 2010/11 an e-course in Moodle became mandatory for all courses of the first year of undergraduate study, namely 20 to 30 percent of traditional face-to-face learning process was implemented in Moodle. Next year blended learning was implemented on second year of study and in academic year 2012/13 all courses of the undergraduate study had their own e-classroom in Moodle. At the same time, the rules that control the quality performance of the educational process in e-course (e-learning policies) were set. In accordance with these rules, any e-course has to include at least:

- an introductory section with basic information about the course,
- two forums: news forum and discussion forum - enabled communication between teachers and students,
- e-content - additional learning resources for independent study,
- self-evaluation activities for students (e.g. quizzes), and
- assignments for students, where teachers' feedbacks about the correctness are mandatory.

At the end of each semester the coordinator for e-learning reviews the adequacy of e-courses according to the rules. So the quality of the pedagogical work in e-courses is regularly monitored and the necessary improvements are made for the next academic year.

Participants (Students Included in the Research)
Due to the heterogeneity of the courses at our faculty we focussed on the obligatory courses at the first year of study and excluded outliers with too high and too low average grades. The final study included 13 courses and five of their properties (the proportion of time the course was held in Moodle, the average grade and the number of admissions to the exams, the level of prompt study and the availability of relevant information). The total number of students from which the aggregation averages were computed, was 205. The data were collected in the academic year 2012/13.

Survey
Students' satisfaction surveys are common to all faculty members of the University of Ljubljana and are a part of the regular annual monitoring of the quality of the FA. In the survey students express their individual opinions regarding the quality of execution of specific subjects and of pedagogical work of participating lecturers. Filling in the survey through web-based information system is anonymous and is secured by a specific IT solution. The results of the surveys are used as a basis for carrying out the habilitation procedures and give a feedback to teachers about their lectures and teaching methods during the year.

Answers to the question range from minus 3 (very bad) and minus 1 (negative) to 1 (good) and 3 (very good). Students can also choose N ("do not know") or even do not respond since the participation in the survey is not

obligatory. Missing responses and the value of N in the analysis of the survey are considered as missing values.

From the students' survey we selected the following two questions about the execution of the course that are related to our study.

Q1: The knowledge, gained in each lesson is checked regularly during the semester.

Q2: Timely relevant information about the course and related duties are available.

In the first question students are asked whether the course enables prompt study in any form. Besides the possibility of partial exams there are different assignments and quizzes, all available in Moodle platform. The second question asked students how well-informed are they about the relevant news related to the course. The Moodle platform offers simple communication between teachers and students via several forums from which students receive instant notifications about the relevant topics directly to their e-mail addresses.

Methodology

In the empirical study we analysed the statistical relationship between the proportion of the course implemented in Moodle e-learning platform and the two aspects of students' effectiveness and satisfaction. We measured the effectiveness with average grades and average number of admissions to exams. Satisfaction was measured with students' opinion on possibilities for a prompt study (Q1) and availability of the course-relevant information (Q2). Graphical estimation of the statistical relationship was made with four scatter plots. We presented two variables which measure effectiveness in one figure, and two variables which measure satisfaction in another as a function of the proportion of the course implemented in Moodle.

We also computed the weighted Pearson's correlation coefficient between the proportion of the course implemented in Moodle and all other analysed variables. Like the traditional coefficient its weighted version ranges from -1 to 1 where 1 corresponds to perfect positive correlation, -1 to perfect negative correlation and values around 0 indicate no linear relationship. We used weighted coefficient to incorporate different number of students who attended different courses. Besides the weighted Pearson's coefficient of correlation, we computed its standard error, t-statistics and corresponding p-value that helped us to test our research hypotheses.

Empirical Results

In order to graphically estimate the statistical relationship we plotted four scatter plots: the x-axis represents the proportion of the course implemented in Moodle in all four plots. The y-axis represents a different variable at each scatter plot. For descriptive purposes we coloured the points with two colours: the black dots represent the courses from the University study programme, the grey dots represent the courses from the Professional study programme. The size of the dot is proportional to the number of students who attended the course (see Scatter plots in Figure 1 represent the relationship between the

proportion of the course implemented in Moodle and the two aspects of students' effectiveness - the average grade (measured from 1 to 10, students pass an exam with grade 6 or higher) and the average number of admissions to the exams. The scatter plots show that the implementation of Moodle has a positive impact on students' effectiveness: in courses with lower proportion of the implementation in Moodle (16 % or less) students got on average lower average grades (below 7 on 1−10 scale) and those courses require on average more admissions (around 1.4) to pass an exam. At the courses with a higher proportion of Moodle (around 30 %) students on average got better grades (around 7.3) and required only a little more than one admission to pass an exam (around 1.05). The relationship is stronger for the courses from the University study programme (black dots).

 and Figure 2).

Scatter plots in Figure 1 represent the relationship between the proportion of the course implemented in Moodle and the two aspects of students' effectiveness - the average grade (measured from 1 to 10, students pass an exam with grade 6 or higher) and the average number of admissions to the exams. The scatter plots show that the implementation of Moodle has a positive impact on students' effectiveness: in courses with lower proportion of the implementation in Moodle (16 % or less) students got on average lower average grades (below 7 on 1−10 scale) and those courses require on average more admissions (around 1.4) to pass an exam. At the courses with a higher proportion of Moodle (around 30 %) students on average got better grades (around 7.3) and required only a little more than one admission to pass an exam (around 1.05). The relationship is stronger for the courses from the University study programme (black dots).
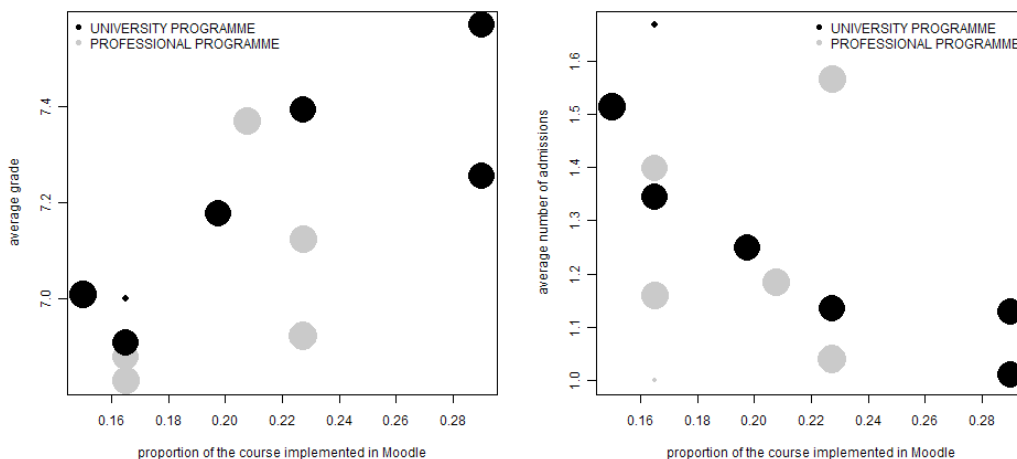

Figure 1. Relationship between the proportion of the course implemented in Moodle and the average grade (left plot) and the number of admissions to exams (right plot).

The scatter plots in **Error! Reference source not found.** show that the proportion of the course implementation of Moodle has a weaker impact on students' satisfaction. In the courses with a lower proportion of

implementation in Moodle (16 % or less) students study less promptly (students' average opinion is below 1 on −3 to 3 scale) than in the courses with a higher proportion (average above 1). But on the other hand, there seems to be no such relationship for the availability of relevant information. Perhaps the main reason is that the students' opinion regarding this question (Q2) shows that the general availability of important information at the faculty level is pretty high (average around 1.7 on scale from −3 to 3).
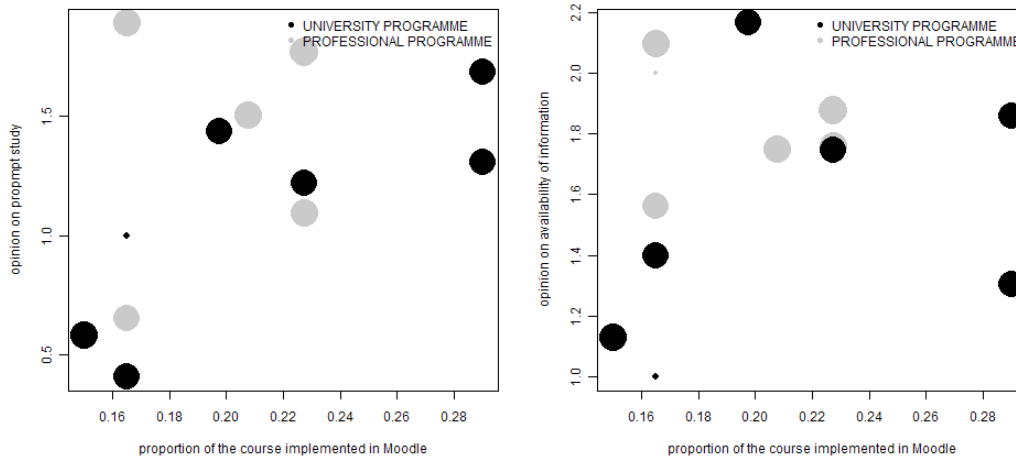

Figure 2.. Relationship between the proportion of the course implemented in Moodle and prompt study (left plot) and availability of information (right plot).

To test our hypotheses H1 and H2 we computed a weighted Pearson's correlation coefficient and estimated the 1-sided p-values between the proportions of the course implemented in Moodle e-learning platform and the two aspects of students' effectiveness (average grade and average number of admissions) and the two aspects of students' satisfaction (Q1, Q2).s Table 1 shows the results of our empirical study.

Table 1

Weighted Pearson's Correlation Coefficient And Related Statistics

Variable	Correlation	Std. errs.	t-value	p-value (1-tailed)	
Average grade	0.70	0.22	3.22	0.004	***
Average number of admissions	−0.56	0.25	−2.23	0.024	**
Q1	0.48	0.26	1.81	0.049	**
Q2	0.14	0.30	0.47	0.323	

Correlation is significant at level: 0.1 (*), 0.05 (**), 0.01 (***).
Source: Survey, 2015.

The empirical study showed that proportion of the course implemented in Moodle e-learning platform is strongly and positively correlated (r = 0.70) to the average grade - the weighted Pearson's correlation is highly significant (p-value: 0.004, see Table 1). This means that in the courses with a higher proportion of workload in Moodle students tend to get higher average grades compared to the courses with lower proportion. On the contrary, the correlation with the average number of admissions to the exams is moderate and negative (−0.56) and still significant (p-value: 0.024). This means that students in the courses with a higher proportion in Moodle require on average less admissions to the exams compared to the courses where the same proportion is lower. The empirical results thus support our first hypotheses (H1) and show that the higher proportion of implementation of a course in Moodle increases students' effectiveness, i.e., increases average grades and decreases the required number of admissions to the exams.

The weighted Pearson's correlation coefficient shows a weaker relationship between the proportion of the course implemented in Moodle e-learning platform and the two aspects of students' satisfaction although the correlations are still positive and one of them significant at 5 % level (see Table 1). We found a modest positive correlation between the proportion of a course in Moodle and the students' prompt study (r = 0.48), which is significant (p-value 0.049). This means that the Moodle environment forces students to study promptly. Although the correlation between the proportions of the course implemented in Moodle e-learning platform and the availability of information regarding the course is positive (r = 0.14), the value is too low to be significantly greater than 0 (p-value 0.323).

The empirical results thus just partially support our second hypothesis (H2). They show that the courses with a higher proportion of their implementation in Moodle require more prompt study but do not provide enough statistical evidence to prove the same relationship with the availability of course-relevant information.

Conclusion

The results of our study indicate that the implementation of blended learning with a LMS platform Moodle at the Faculty of Administration, University of Ljubljana, resulted in a statistically significant increase of students' effectiveness, measured with the average grade and the average number of admissions to the exams. We confirmed our first research hypothesis (H1) that a higher proportion of implementation of a course in Moodle increases students' effectiveness, i.e., students get on average better grades and require less admissions to pass the exam. We have partially confirmed our second research hypothesis (H2) that a higher proportion of implementation of a course in Moodle has a positive impact on students' satisfaction: we showed its positive impact on satisfaction with more prompt study but did not find enough statistical evidence to show its impact on the satisfaction with the availability of relevant information.

Main limitation of the research was a limited data set. Due to the anonymity of the students' survey we could not link students' answer to their grades.

Therefore we had to aggregate the data and analysed courses as units of observation. Such aggregation reduced the sample size and blurred possible relevant relationships. Besides that, the courses at FA are very diverse, therefore we had to limit our survey to just the first year of study with the highest number of students and the most homogeneous subgroup of courses in terms of Moodle's usage. The other limitation is hidden in the students' survey where the focus is on the evaluation of teachers and courses while no questions in the survey are directly measuring the satisfaction with blended learning and its implementation with e-learning system Moodle.

To conclude, the obtained results of the study can, however, serve as an important background when deciding on the future development of e-learning at the Faculty of Administration. Our future work will concentrate on introduction of another survey in 2015, which will be specialized in evaluating the Moodle environment by students and teachers and will link the students' answers to their effectiveness. The results of our future surveys will provide more insight into the relationships we studied in this paper.

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