Analysis of ICT students' LMS engagement and sucess

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Varazdin Development and Entrepreneurship Agency
in cooperation with
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Economic and Social Development

35th International Scientific Conference on Economic and Social Development –
"Sustainability from an Economic and Social Perspective"

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PROFESSOR DR. AYUBA A. AMINU ON BEHALF OF THE SCIENTIFIC COMMITTEE PRESIDENT AT THE 35TH INTERNATIONAL CONFERENCE ON ECONOMIC AND SOCIAL DEVELOPMENT - "SUSTAINABILITY FROM AN ECONOMIC AND SOCIAL PERSPECTIVE"; 15 - 16 November 2018; Lisbon, Portugal

On behalf of the President Scientific Committee, who is unavoidably absent from this event, I wish to happily welcome all of you to the 35th International Scientific Conference of Economic and Social Development. As I welcome you to this year's conference, let me cease the opportunity to trace briefly, the history of ESD scientific conference and recall its objectives. ESD-conference started in Frankfurt 2012 to interrogate issues bordering on global development from the prisms of economic and social dimensions. The broad idea is to promote, develop and improve the economic and social development confronting modern society, without territorial, ethnic and religious exclusivity. We support the principles of economic efficiency, sustainable social development, corporate social responsibility and social entrepreneurship. In addition, we create the platform to assist scholars and researchers to exchange their research findings with colleagues across the globe and to create conducive platforms that allow participants to network among each other for harmonious linkages in research, innovation and development using international best practice. This way we support them to work together towards seamless career progression and developing scholarly research that positively impact on human development.

Since the first conference in Frankfurt in 2012, we have successfully organised 34 conferences and today we are now opening the 35th conference which is a good achievement by all standards. This conferences were hosted by classy universities in Frankfurt, Paris, Belgrade, Vienna, New York, Istanbul, Zagreb, Miami, Bangkok, Barcelona, Split, Warsaw, Melbourne, Prague, Madrid, Moscow, Rome and Rabat. The Lisbon conference is co-organized by: GOVCOPP – Universidade de Aveiro, Portugal; CPES – Universidade Lusofona, Portugal; CICPRIS – Universidade Lusofona, Portugal; University North, Croatia; Faculty of Management University of Warsaw, Poland; Faculty of Law, Economics and Social Sciences Sale - Mohammed V University in Rabat, Morocco.

At present the ESD has finalized arrangement for the ESD conference to be held annually in the followings cities; Lisbon, Belgrade, Zagreb, Split, Warsaw and Moscow. Also part of the giant strides of scientific committee was the publication of twelve of our conference Books of Proceedings which have been included in Web of Science (CPCI – Conference Proceedings Citation Index), and others are still under evaluation. Many of the papers presented in our conferences have been published in mainstream journals and other scholarly outlets thereby impacting on global knowledge development, transfers and practice that promote global development.

The theme for this year's conference, "Sustainability from an Economic and Social Perspective" is apt and timely in view of the urgent need to achieve sustainable development goals (SDGs) set by the United Nations for the year 2030. It is our expectations that this conference will generate fresh ideas that would quicken the attainment of these goals and in the process contribute in promoting better condition for humanity across the globe. Once again on behalf of the President of the Scientific Committee I welcome you all to this conference and to the pleasurable ancient city of Lisbon; hoping that you will find space to refresh yourselves by visiting important tourism locations and enjoy the rich culture and hospitability of Lisbon.

I would like to close this address with a round of thanks for all those who were able to be here at this conference venue and those we are expecting before the closure of the conference that this great conference is going to be interesting to participants. Once again on behalf of the President of the Scientific Committee, I welcome you all to Lisbon and wishing you successful deliberations during the conference and safe journey to your respective destinations at the end of your stay.

Professor Dr. Ayuba A. Aminu
Professor of Business Management, University of Maiduguri, Nigeria

ANALYSIS OF ICT STUDENTS' LMS ENGAGEMENT AND SUCCESS

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ABSTRACT
Big data and analytics are shaping the future of higher education. Their role is significant in creating guidelines for reform activities and in assisting educators, students, and administrators in improving teaching and learning. This paper tackles one aspect of this phenomenon. The aim of this study is to examine whether and to what extent students` activity at the Learning Management System (LMS) can be a predictor of academic success. Log file analysis is performed from a blended course in the field of Information Communication Technology (ICT). Results indicated no significant correlation between students` behavior and grade attitudes and participation could be identified. However, differences between male and female students are identified.
Keywords: *Academic success, educational data mining, learning analytics, log file analysis, students' performance*

1. INTRODUCTION

The massive increase of data stored in education domain on the one hand, and raise in the power of available software tools and algorithms for data analysis, on the other side, had led to the development of the educational data mining and learning analytics fields. Today, learning in higher education is inevitable without the support of information and communication technologies. Education institutions often use learning management systems (LMS) to support the teaching and learning process. An LMS stores data about students' activities in log files. The aim of the study presented here is to measure the student's activity by analyzing the log files of LMS in one course at the Information Technology (IT) setting. With the aim to achieve the above-mentioned goal, the statistical methods are applied. Results of the log data analysis are potentially useful for students, teachers and educational institutions. Increasing choice and quality analysis of the educational programs lead to the need for continuous improvement of their processes. In-depth analysis of the students` success at higher education institutions and faculties can yield interesting and useful insights - both for higher education institutions and faculties as well as for students themselves. Those findings are helpful for adaption or change in the current education system to improve its quality and efficiency, with the aim of creating better and more competent students - experts of their orientation. Long-term strategic planning of study programs leads to the increase in student success and their satisfaction level (Oladokun, Adebanjo and Charles-Owaba, 2008). This paper is organized as follows. Section 2 presents the results of the previous research related to the topic. Section 3 explains the data and methodology used in the study and presents research results. Section 4 concludes the paper and gives recommendations for further analysis.

2. BACKGROUND AND PRIOR WORK

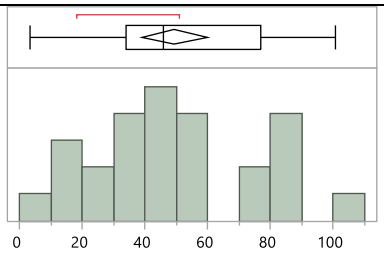
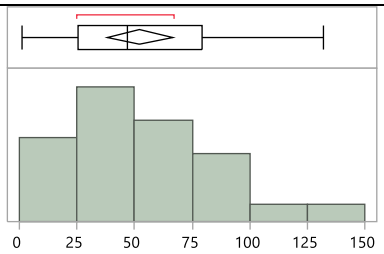
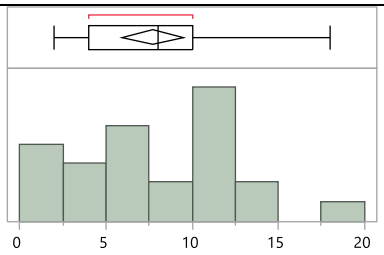
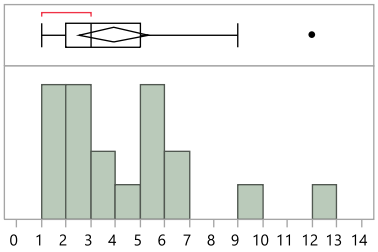
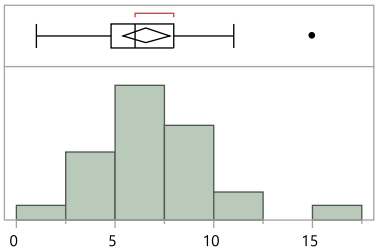
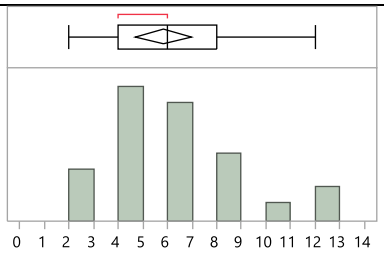
Students` academic success is one of the most important indicators of the education system quality, as well as higher education institutions quality. Thus, it is an interesting topic for research.

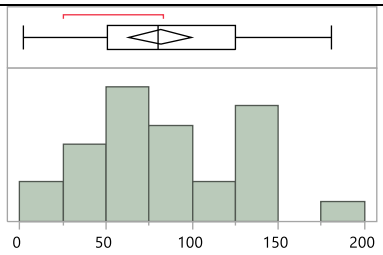
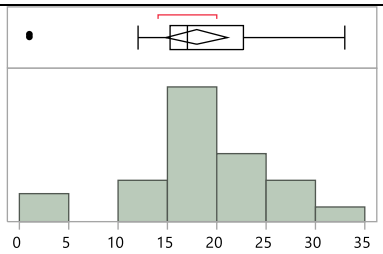
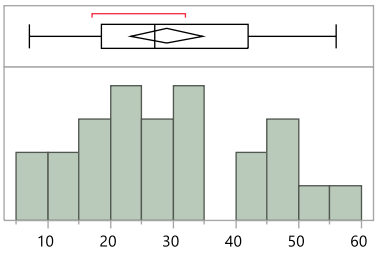
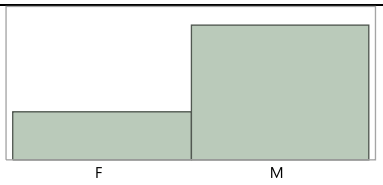
Previous papers were mostly focused on the student success prediction and identification of student success determinants based on socio-demographic data, personality, and intelligence testing, learning styles, self-discipline or study habits and attitudes towards study. Such models are presented in the papers of e.g. Wilson and Hardgrave (1995), Ting and Robinson (1998), Busato et.al. (2000), Barchard, (2003), Duckworth and Seligman, (2005), Credé and Kuncel, (2008), York, Gibson and Rankin (2015), Rimfeld et al. (2016). Currently, there is an increasing interest in the analysis of data from learning management systems (LMS). Those platforms provide multiple channels for teachers and students to communicate in a course, share files and information, prepare and upload assignments and tests, interact in discussions. Learning management systems store log data of the students' activities and have implemented student monitoring features (Mazza and Milani, 2005). Romero and Ventura (2007) explored the application of data mining to learning management systems. Authors investigated the advantages of particular data mining techniques for LMS data analysis. LMS enables a student-centered approach of participation. The most frequently investigated topics towards LMS are students' satisfaction and acceptance of the courses. (e.g., Bollinger & Martindale, 2004; Martínez-Caro & Campuzano-Bolarín, 2011). Gender differences in students' attitudes are also explored. Many researchers focused on gender differences in LMS usage and attitudes. Huang et al. (2012), Li and Kirkup, (2007) and Rozendaal, Minnaert, and Boekaerts, (2003) find that male students have more positive attitudes than female students. Yukselturk and Top (2012) explored the participation of students and classified students by gender and other individual characteristics. The focus of their research was at the gender differences. Results indicated females` participation was more intensive then males`. These results are in line with previous studies of Caspi et al., (2008), Crocco, Cramer, and Meier (2008), González-Gómez et al. (2012), Kimbrough et al., (2013). Furthermore, the authors emphasized females` engagement in communication with other students and teachers. However, these findings are different from results of Prinsen, Volman, and Terwel (2007) which indicated the more intensive participation of male students. Since students` participation in online course activities can enhance learning, there is a need to investigate the impact of such participation on student course performance measured as students` grade. This paper presents a case study based on an undergraduate IT course. Results of such research and analysis can be precious in order to adapt or change the current education system with the aim of improving its quality and efficiency. Hereinafter, we will present the results of our research tackling this issue.

3. DATA ANALYSIS

Student's usage statistics are usually the starting point of LMS learning analytics (Romero et al., 2007). Such statistics include measures as the total number of logs to the systems, number of views for specific resources, students distribution over time, the most frequent accessed sources. Student participation in a learning management system here is analyzed in quantitative terms, and it is performed in order to gain insight into student engagement. Following the completion of the academic year, data on the student usage of the learning management system was performed. Course Knowledge discovery in data taught at the University of Zagreb, Faculty of Organization and Informatics, was included in the research. The number of students included was 27. Three hours teaching lectures were held every Monday and three hours laboratory exercises were held in two groups: one every Tuesday and another every Wednesday. The collected data were analyzed, and the following information was compiled: (i) descriptive statistics and distribution of the variables indicating usage of specific resources, (ii) visualization of the patterns of usage, (iii) calculations of correlations. First, variable distributions are given in Table 1. In the first column, variables are provided, and in the second column, there are distribution numbers of students per students logs with respect to the observed variable.

Table 8: Data description

Variable	Distribution
Files view	
Forum view	
Student report	
Folder view	
Choice	
File upload	

System login	
Test	
Assignment	
Gender	
Mode of the study	

The variable files view is related to access any file in the system. The files are mainly related to the lecture notes and teaching materials. There were students that accessed only several times to the files on the system. There are also students with more than 100 logs to files on the systems. The highest number is the number of students that made between 40 to 50 logs to the files on the system. When considering the forum view, most of the students made 25- 50 logs on the system. Similar conclusions can be derived for all other variables, except the last two. Last two variables are not related to the logs of the students, but to real values of the variables gender and mode of the study. In the course, there is a higher number of male students (21) than female students (7). In terms of the mode of the study, we differ full-time and part-time students. In the set, there were 22 full-time, and 6 part-time students. Figure 1 shows an average number of logs across the semester by gender. Female students have a higher averaged number of logs than their male colleagues. Additionally, Figure 1 presents the average grade by gender. Female students have a higher average grade than the male students. There is a correlation between a number of logs and average grade in terms of gender.

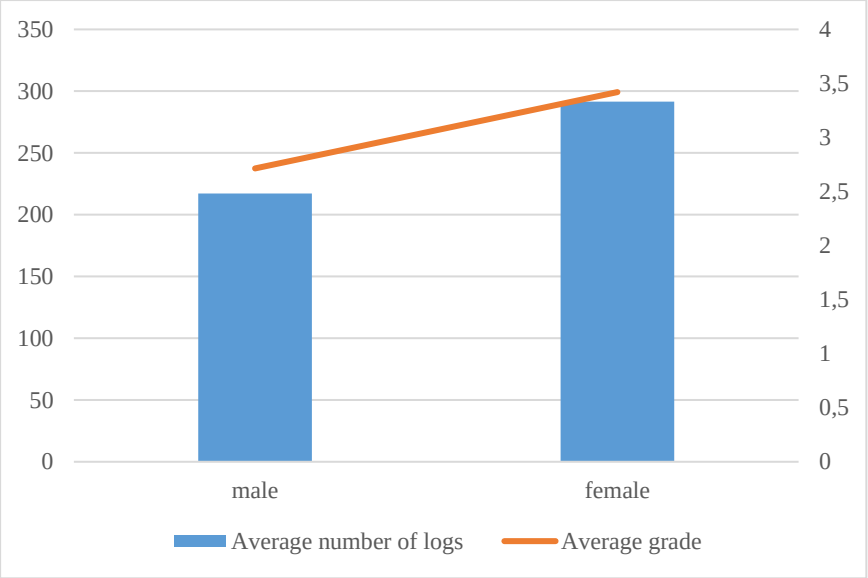


Figure 9: Average number of logs by gender

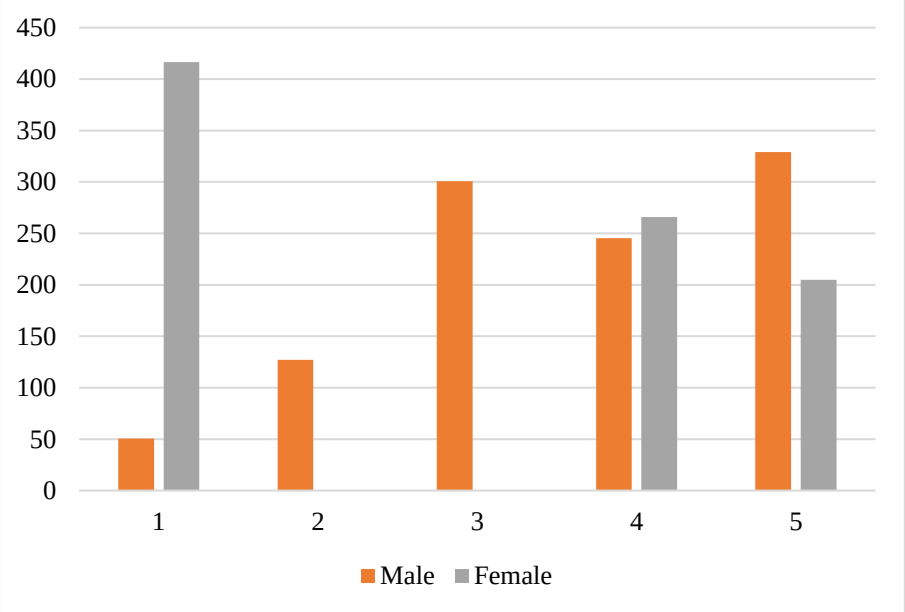


Figure 2: Average number of logs by grade

Figure 2 presents the average number of logs by grade and gender. It is interesting to note that the highest average number of logs have female students who fail the course. They are followed by male students that achieved the highest grade, 5. A high number of logs for the students that achieved a high grade seemed to be more logical and expected that the high number of logs and the lowest grade, which is the case here. Then, a more detailed analysis was conducted and it showed that those female students that achieved the lowest grade, but made the highest number of logs, were part-time students. The part-time students in most cases do not attend classes physically. That suggests the conclusion that attending the classes is an important factor in passing the exam with a high grade. Figure 3 shows the number of logs from the 1st to 19th week of the course. The 8th and 12th week of classes are the weeks during with the highest number of records. Due for assignments upload was in the 8th week of the course), and the test was held in the 12th week of the course. Those are the reasons for increased activity. There was a general upward trend in activity until week 12, after which the teaching was over, and students did their projects.

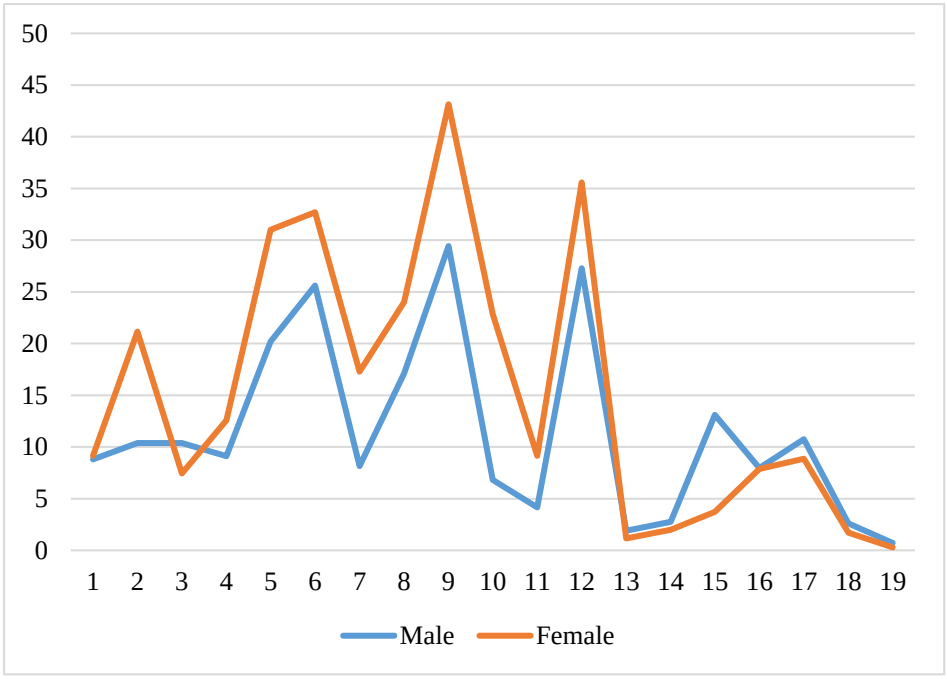


Figure 3: Distribution of logs per weeks

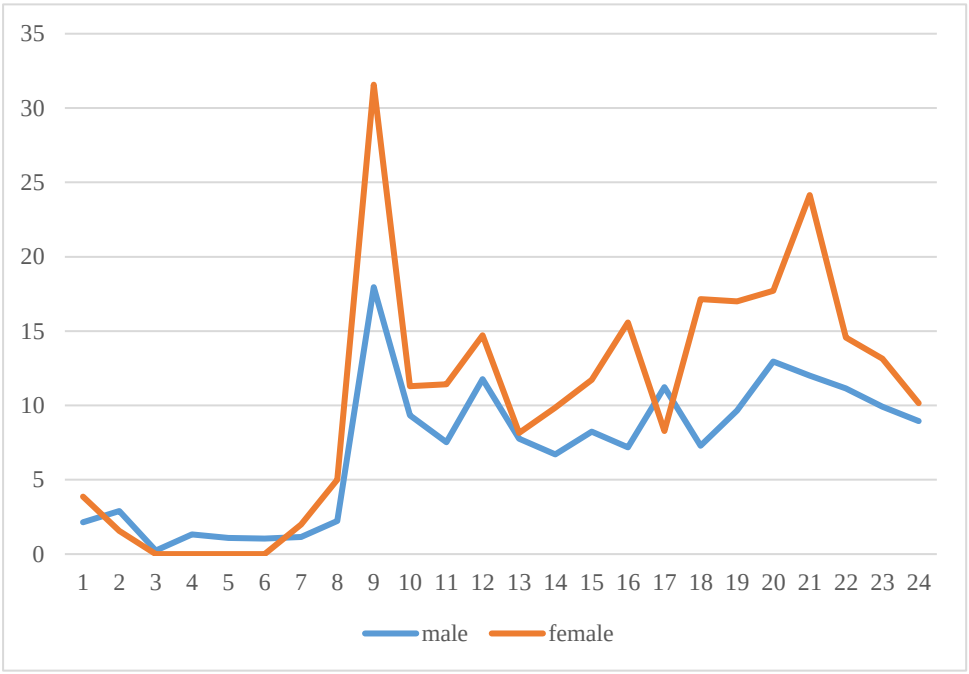


Figure 4: Distribution of logs per day hours

Figure 4 shows the averaged number of logs per day hours and gender. Most of the activities at the course LMS was performed between 8 am, and 9 am. Since both groups of laboratory exercises were at that time, students were engaged into file and folder views and assignments uploads. After that, the general trend increases until evening when increases again slightly, perhaps indicating a belated effort by students to see forum news. Previous research indicated that the ways in which students engage in learning management systems would influence the learning outcomes (Cotton and Yorke, 2006). To investigate if there is any correlation between specific activities on the LMS and grades, we have performed correlation analysis. Results are presented in table 2.

Table 2: Correlation analysis

Variable	Variable	Correlation
Forum	File view	0,988804
Students report	File view	0,990833
Students report	Forum	0,989881
Folder view	File view	0,984207
Folder view	Forum	0,979175
Folder view	Students report	0,979979
Choice	File view	0,993976
Choice	Forum	0,989721
Choice	Students report	0,995237
Choice	Folder view	0,980252
File upload	File view	0,995952
File upload	Forum	0,986588
File upload	Students report	0,993106
File upload	Folder view	0,979779
File upload	Chioce	0,994497
Report	File view	0,975506
Report	Forum	0,971357
Report	Students report	0,979057
Report	Folder view	0,997928
Report	Chioce	0,980492
Report	File upload	0,972551
Test	File view	0,993891
Test	Forum	0,992324
Test	Students report	0,993271
Test	Folder view	0,981866
Test	Choice	0,994953
Test	File upload	0,991452
Test	Report	0,977592

The results indicate a statistically significant correlation among students' test, files and folders viewing. However, there is a lack of association between grades and other logs in the course. Students demographic characteristics (gender, mode of study) are also not related to the grades.

4. CONCLUSION

In this paper, a learning analytics approach is used for analysis of IT students` activity at the LMS to analyze student's performance. In line with previous research, results presented here outlined that the behavior of students online differs between male and female. Female students are more engaged in the activities and active usage of LMS resources. Gender effects may be explained by female participants' higher compliance with social interaction rules. Although our paper offers contributions in terms of insights, there are several limitations. The presented findings are limited to the IT students at one university. Future research should include other fields of study. Other activity domains and cultural contexts should be examined, as well. Future research should additionally employ advanced machine learning methods.

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