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The Development of Distance Learning in Ukrainian Liberal Arts Institutions Based on EU Experience

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Abstract—Distance education and blended learning has been becoming a major alternative to traditional teaching all over the world. The paper discloses the benefits and disadvantages of e-learning at Ukrainian Universities in particular at Ternopil V. Hnatiuk National Pedagogical University as the representative when compare to European models of distance education. Distance education at Ukrainian Universities bases on the principle of individuality and supports by tutor. Using multivariate statistics it has proven that self-motivation and both intrinsic and extrinsic goal orientation predict student success in distance education and e-learning. The perceived learning outcome is positively associated with to self-regulation, learning styles and success.

Keywords—distance education; blended learning; Moodle

I. INTRODUCTION

The global technological progress is one of the reasons for shifting in the paradigm of education, where information technology, web-technology and pedagogy are considered as a union. An important place in this paradigm is occupied by distance education (long-distance learning), which contributes to the intellectual and mental development of the individual, forms critical and creative thinking, increases the working ability with data basis and makes independent decisions. The specificity of teaching in modern universities determines the urgent demand for active implementation of distance learning along with traditional full-time and partially correspondence types of study or its combination with tradition type of education, developing special learning techniques in terms of learning methods and tools of both traditional and distance education. Distance learning encompasses all technologies and supports the pursuit of lifelong learning for all” [1].

Nowadays, classes based on individual training schemes are very popular in different countries [2]. Moreover, the range of providers of distance education is broad and includes preparatory institutions, technical

schools, colleges, universities as well as numerous training centers and consulting companies, resulting in covers all areas of activity. The state of the distance learning globally continues to shift, grow, evolve and improve. This has demonstrated by increasing budget allocations for educational programs, the growing popularity of e-learning in various countries around the world, new trends in emerging technologies and tools that support e-learning. According to Ambient Insight in 2016, the global e-learning market volume was 46,674.7 US \$ Millions [3]. In Ukrainian education the present trend is just starting to intensify.

II. EUROPEAN EXPERIENCE OF DISTANCE LEARNING

The up-to-date model of education is suffering changes, meeting with renovations, and increasingly harnessing the privileges of technological progress, among them the Learning Management System (LMS). One of the most popular LMS platforms is the Moodle which is widely used in Europe to support different forms of education. Permanently Moodle is much more popular in Poland than all the other platforms [4]. E-learning via Moodle is regular and competent, even sometimes difficult. To work at home is a profit and the distance learning offers both to the educational institutions and for the students a flexible schedule and more time for family and their private life. Meanwhile the mandatory condition for distance education is a high portion of student’s self-activity all along the learning process. Students by their own determine the rate and way of acquiring the competences and fundamental knowledge.

Moodle-based distance education is widely used in Warsaw University of Technology, Wrocław University of Technology and Częstochowa University of Technology, Cracow University of Economics, Bielska Wyższa Szkoła im. Józefa Tyszkiewicza and not limited to. Using Moodle at Wrocław University of Technology and Częstochowa University of Technology enables one to introduce the number of interactive elements and

activities like chat, lessons, exercises, quizzes, and “flash activities”. The platform has become not only the source of information exchange between the lecturer and the students, but also it gave the possibility of self-evaluation of the knowledge and gained functionality of electronic tutor. Electronic tutor contains analysis of the problems which students most often report during traditional classes. Moreover, students’ satisfaction survey on e-learning conducted at Czestochowa University of Technology indicated that 41% of questioned students were interested in more e-learning classes, and 32% that the number is just enough [4].

The Moodle Platform also has been increasingly used at Polish Universities in particularly at the University of Gdansk as a tool supporting the traditional way of teaching. In 2017 its Moodle contained 1787 e-courses. According to university experience and permanent survey they preferred blended-learning method which allows combination of modern and traditional teaching techniques. 93.2% of all the surveyed students at the university’s Faculty of Management recognised blended-learning approach is a good solution for supporting the traditional teaching process [5]. Besides 50 % of the students pointed extremely high usefulness of this method. Unexpectedly respondents specified easier access to the educational materials (85.7%) the main benefit of the blended-learning method.

In the world, Moodle has a great competitor – a commercial platform called Blackboard. Blackboard Learning System is a comprehensive and flexible e-Learning software platform that delivers a complete course management system. Meanwhile Subramanian et al. [6] compared Moodle and Blackboard using 3 kinds of collation which was based on communication tool, productivity tools and student involvement tools and showed that Moodle provided better results than Blackboard.

III. RESEARCH DESIGN AND METHODOLOGY

Surveys were administered to Ternopil V. Hnatiuk National Pedagogical University (TNPU) students enrolled in online courses in different scientific fields, among them biology, maths, pedagogy, psychology, physics, history, English language, physical rehabilitation and IT. To obtain a representative sample, we gathered the opinions of as many students as possible (a total of 5104 students have studied at eight faculties namely psychology-pedagogy (25%), chemistry-biology (15%), physics-mathematics (15%), engeneering education (12%), physical training (7%), arts (4%), history (7%) and foreign languages (15%). A majority (60%/40%) of student population was represented by women and all of them were 19-23 years old. Out of the surveyed students, 78% were at undergraduate level of study and 22% were at graduate level. Each student has taken at least one e-learning course. The courses were taught online in similar manner with the instructor distributing two video-recorded lectures each week and holding synchronous virtual office hours for 4 h that allowed students to use institution-provided web-conferencing technologies and

Web 2.0 tools, in addition to sending e-mails throughout the week. The courses all used Moodle to help students manage the online courses. In the mid of learning a subject, we have proposed each enrolled student to make the assessment test. The questionnaire was posted first in Intranet in 2009 and was accessible for three weeks to all students enrolled at that time. The set of questions comprised demographics (age, gender, nationality and cultural background), peculiarities of education process (faculty, mode of study and enrolment, major area of study, experience with online courses), perceptions of the e-learning (for example time management), perceptions of courses (content, deep sense of meaning, structure, clarity etc) and perceptions of the tutor.

Data were tested for the normality and homogeneity of variances using Kolmogorov-Smirnov and Levine test, respectively. For the data deviating from normality or homogeneity of variances, Box-Cox or \log_{10} transformation was used. If the transformations did not result in normal distribution, non-parametric tests were used. The effects of analysed predictors on student success in distance education and e-learning were tested by ANOVA/MANOVA and multiple regression analysis. The weighted Pearson coefficient of correlation was used to incorporate different numbers of students who attended different courses. All statistical calculations were performed with Statistica v. 12.0 and Excel for Windows-2013. Differences were considered significant if the probability of Type I error was less than 0.05.

IV. PRACTICAL APPROACH OF UKRAINIAN UNIVERSITIES TO E-LEARNING

We have chosen Ternopil V. Hnatiuk National Pedagogical University as the representative for disclose peculiarities of the e-learning at Ukrainian Universities. E-learning at TNPU was implemented ten years ago on Moodle and up to now our Moodle platform counts 1752 courses in different areas of study, among them biology, maths, pedagogy, psychology, physics, history, English, German and French languages, physical rehabilitation, IT. When a course creates, we follow several quality standards namely informative content, structure environment, communication and availability, cooperation and interactivity, student assessment, flexibility, functionality technical support, faculty qualifications in terms of using novel teaching and learning technology, reports and recommendations for course improvement, vision and institutional leadership, and resource allocation due to recommendation of Swedish National Agency of higher education (2008). The materials for students have been created in Microsoft Word and PowerPoint. Also, Adobe Presenter is used to create multimedia lectures, because it makes possible to add audio and video. Sometimes Faculty tackle lack of knowledge in computer sciences and graphics. Nevertheless, rapid E-learning Tools (PowerPoint, Adobe Presenter, QuickLesson, ProForm Rapid e-Learning Studio etc) allow to decrease the time needed to prepare materials and apply synchronous and asynchronous

models of e-learning as well as propose a very interesting and functional interface for ready presentations.

Distance learning system at TNPU allows students to combine learning in class (if possible) and self-study using emerging technologies and tools (video lectures, audio lectures, virtual works in groups). On-line course has a structured plan of study for a semester presented as headlines of subject topics and supplemented materials or links to external resources (including www.coursera.org, prometheus.org.ua, www.ed-era.com, www.khanacademy.org); varieties of test questions (multiple and single choice, true-false statements, problem statements, short answers, numerical answers calculated tasks and essays), package for creative tasks, exercises and construction of projects; sample tests for competitive exam preparation; glossaries, forums, databases and chats where students and faculty can work together to solve various issues and tasks; option to vote, prepare feedback in the form of short online surveys. Recently we have implemented the Adaptive Test option which permits a Faculty to create tests that validity and efficiently measure the students' abilities and performance. Adaptive tests include a set of questions and tasks selected from the internal bank with different complexity. In general database counts 20-25 questions per hour. The tasks are chosen to match the assessed capacity of the particular student. If the student thrives on a question, a more complicated question is presented next. If the test-taker answers a question incorrectly, a less-challenging question follows.

Our on-line courses refer to developing of professional competencies namely i) Interindividual dialog, ii) English Proficiency, iii) Teamwork Skills, iv) Planning, organisational and leadership qualities, v) Writing and speaking Skills, vi) Responsiveness ability, viii) Ability to implement novel methods of collecting, storing and presenting databases and knowledge in intelligent systems under various conditions, ix) Evaluation and satisfaction of learners needs, x) Ability to use a modern scientific paradigm, a systemic view of the dynamics of a field of scientific and professional activity development, xi) Ability to apply modern technologies of collecting, processing and interpreting the experimental data, xii) Ability to self-study of new

research methods related to innovation areas, xiii) Ability to use the theoretical backgrounds and practical methodologies in fundamental and research activities for solving professional problems [7].

Based on EU experience (for example [5]) and our own findings we have decided to offer blended-learning as a mixing of distance education and on-Campus study (Fig.1). It has proven that student retention which pertains to the set of the markers of academic achievement and study satisfaction was higher when they attended blended-learning method (84%), but lower when university provided solely online education or face-to-face instruction (72% and 79% correspondingly). Our findings are in consistent with previous reports disclosed low retention rate in online distance education [8, 9]. It should be interpreted by students' loneliness and feelings of disconnection, poor IT skills and/or insufficient technological support, poor course instructional design, Faculty who doesn't willing to teach online, limited student-tutor interaction, low student motivation, and lack of self-regulation and so on.

Recently we also have implemented the experience of University of East London (www.uel.ac.uk) namely to assign a tutor to foreign students from Greece and Slovakia who study at TNPU. Tutor i) assists the students with developing their own research projects; ii) holding their own independent research for identifying factors contributing to improved learning outcomes; iii) advises the students on issues of rules and regulations adopted in university; iv) manages the students' transition to the next level learning in the development and implementation of the previous level. Tutor provides materials in electronic format; supports students, gives them valuable comments, organizes communication in forums or by email.

We have analysed the predictive power and effects of several predictors on student success in distance education and e-learning. It was proven that the dominant positions within eleven predictors namely age, gender, initial level of education, self-motivation, learning style, intrinsic and extrinsic goal orientation, expectations and measurable outcomes, task orientation and value, self-regulation and test anxiety, referred to self-motivation

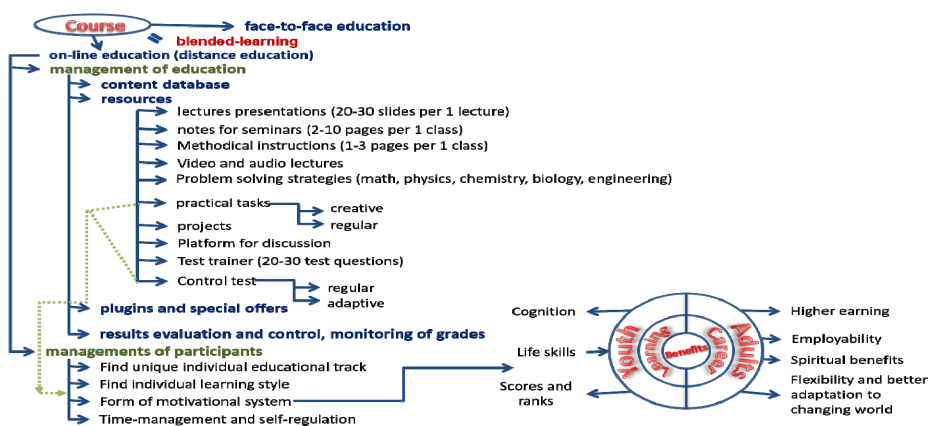


Figure 1. Scheme and algorithm of e-learning based on Moodle platform in Ternopil V. Hnatiuk National Pedagogical University

and both intrinsic and extrinsic goal orientation ($F_{11, 189}=64.5$, $p<0.001$, $F_{11, 189}=53.2$, $p<0.001$, $F_{11, 189}=51.1$, $p<0.001$ correspondingly). All Cronbach's alpha coefficients are greater than 0.70. Our results contradicted to [10] who had determined that only self-regulation is a statistically significant predictor of student success in an online computer programming course, but was in line with [11] who had shown that self-efficacy variable and the intrinsic motivation variable also significantly affect student achievement. One of the prospective benefits of the present study was its significance in providing essential insight into student features and how they correlate to success in e-learning (Fig. 2), so that administrators, tutors and faculty could understand how best to support students who select courses.

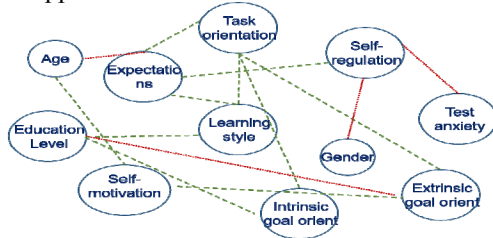


Figure 2. Grafical representation of correlation between predictors of students success in distance education. Solid line refers to significant negative correlation ($r<-0.55$, $p<0.001$), dash line refers to significant positive correlation ($r>0.55$, $p<0.001$)

We analyzed the correlation between learning styles namely visual, aural, verbal, physical, logical, social and solitary, perceived learning outcome, computer skills and English proficiency [12], as well as the self-regulation and success of students enrolled in on-line courses of pedagogy, psychology, biology and physical rehabilitation. On the one hand there is a positive correlation between student self-regulation and success ($r = 0.51$, $p < 0.01$) and on the other, there are two inter-correlated blocks ($r = 0.42$, $p < 0.05$). One of them gathers visual, logical and solitary learning styles, computer skills and other, aural, verbal, physical and social learning styles as well as English proficiency. Perceived learning outcome takes intermediate position (Fig. 3).

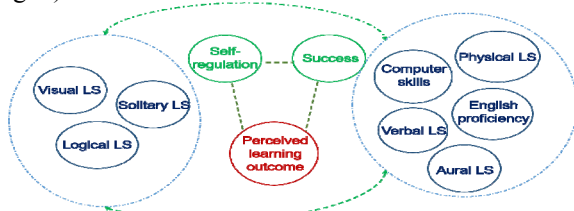


Figure 3. Grafical representation of correlation between learning styles (LS) and perceived learning outcome and individual characteristics

The present research model proves that self-regulated learners are flexible and are able to select the most appropriate learning styles depends on demands of a particular situation. The perceived learning outcome strongly relates to self-regulation, learning styles and

success, moderately to English proficiency, but bears no relation to computer skills that in general is in consistent with [12].

V. CONCLUSIONS

To sum up, distance learning in the system of professional education in social, humanities and life-sciences is proven its effectiveness. It has the features of accessibility, economy, individualisation, flexibility, and takes into account demands of modern society. Blended-learning as a mixing of distance education and on-Campus study is intensively penetrates into educational style of at Ukrainian Universities and promotes better results than distance education alone. The main findings of this research indicate that self-motivation and both intrinsic and extrinsic goal orientation ($F>51.1$, $p<0.001$) predict student success in distance education and e-learning. The perceived learning outcome strongly relates to self-regulation, learning styles and success (Mahalanobis distance <425 , $p<0.001$). These estimation should be taken into account when considering how to improve students' accomplishments.

REFERENCES

- [1] J. Lockard and P.D. Abrams, "Computers for twenty-first century educators," Boston, MA: Pearson/Allyn and Bacon, p. 56, 2004.
- [2] R. Cardozo de Castro Junior, T.C. Medeiros, H.M. Honório, E. Sant'Ana, and P.S. da Silva Santos, "Moodle: Teaching Strategies in distance education in oral medicine," *Edu. Res. Internat.*, vol. 2017, p. 4, 2017.
- [3] Elearning market trends and forecast 2017-2021 / <https://learningnews.com/media/30885/docebo-elearning-trends-report-2017-short.pdf> Assess by 19.01.2019
- [4] J. Rosak-Szyrocka and P. Wojciechowski, "E-learning as an effective educational space in Poland: the benefits and disadvantages of studying using Moodle," *J. Achiev. Mat. Manuf. Eng.*, vol. 73/2, pp. 237-246, 2015.
- [5] A. Szadziewska and J. Kujawski, "Advantages and disadvantages of the blended-learning method used in the educational process at the faculty of management at the university of Gdansk, in the opinion of undergraduate students", *Proceedings of the ICERI2017 Conference*, 16th-18th November 2017, Seville, Spain, pp.3938-3946.
- [6] P. Subramanian, N. Zainuddin, S. Alatawi, T. Javabdeh and R. Che Hussin Ab, "A study of comparison between Moodle and Blackboard based on case studies for better LMS," *J. Inform. Sys. Res. Innov.*, pp. 26-33, 2014.
- [7] E.C. Thach and K.L. Murphy, "Competencies for Distance Education Professionals", *Educat. Technol. Res. Devel.*, vol. 43, pp. 57-79, 1995.
- [8] C. Latchem and I. Jung, "Quality assurance and accreditation in open and distance learning", in C. Latchem and I. Jung (Eds.), *Quality assurance in distance education and elearning: Models, policies and research*, New York, NY: Routledge, p. 13-22, 2012.
- [9] M.J. Kruger-Ross and R.D. Waters, "Predicting online learning success: Applying the situational theory of publics to the virtual classroom," *Computers and Education*, vol. 61, pp. 176-184, 2013.
- [10] E. Yukselturk and S. Bulnut, "Predictors for student success in an online course", *Educat. Technol. Soc.*, vol. 10(2), pp. 71-83, 2007.
- [11] P.R. Pintrich and E.V. DeGroot, "Motivational and self-regulated learning components of classroom academic performance", *J. Educat. Psychol.*, vol. 82, pp. 33-40, 1990.
- [12] S.B. Eom, H.J. Wen and N. Ashill, "The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical investigation," *Decision Sci. J. Innov. Edu.*, vol. 4(2), pp. 215-235, 2006.