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Contents

Editorial

The content of volume 3, issue 1 of the *International Journal of Research in E-learning* proves that technology is the key to the future of (higher) education. Authors from eleven countries consider present and future trends in the development of education. The present volume includes nine papers gathered in four chapters.

Chapter I – "Global Prospects of Distance Education and High-tech Electronic Learning Environment Design" – includes two articles. In their article entitled "E-learning Specialists Training for IT Infrastructure of an Educational Institution Management," Nataliia Morze, Iryna Vorotnykova, and Rusudan Makhachashvili disclose the possibility of training e-learning specialists to manage the IT infrastructure of educational institutions. The contents and results of lifelong learning competencies formation and professional competencies, skills, and soft skills in the course of "Managing the IT infrastructure of an educational institutions" are studied. Content training for specialists in e-learning is defined by such topics as "ICT policy and IT infrastructure of educational institutions," "Program and technical solutions for building IT infrastructure of educational institutions," "Using cloud technologies for IT infrastructure of educational institutions," and presented as an e-course that includes educational materials and competence tasks that form a competence for lifelong learning (communication in mother tongue, communication in foreign languages, knowledge of mathematics and general knowledge in the field of science and technology, skills in digital media, training for gaining knowledge, social and civic skills, proactive position and practical approach, awareness and self-expression in culture) and professional competence (in educational, technical, managerial, and project activities). The feasibility of using competency tasks to prepare specialists in e-learning is confirmed by educational achievements of 94 full-time and part-time students. What is analysed are the students' acquired soft skills (flexibility, teamwork, leadership, outgoingness, social skills, creativity). Anna Ślósarz, a researcher from Poland, stresses in her article "Global Prospects of Distance Education" that distance education conferences and publications have the longest tradition in Western world countries, where they are focused on introducing professional solutions into business and administration. In Asia, the implementation of distance education is linked to social development

and global expansion of national business within the framework of government strategies. In Latin America and in Africa, distance education provides assistance in equalising educational opportunities and in promotion of peace. In post-communist countries, academic centres poorly cooperate with administration and business sectors, which offer competitive and most attractive distance education courses. Algorithmisation of distant education courses results in insufficient development of self-reliance, creativity, and empathy of employees.

Chapter II, "Models of Distance, Blended, and E-learning," includes three papers. The first one, "Models of Distance Learning in Higher Education," is prepared by a Czech researcher Lucie Zormanová. This article is focused on distance learning in higher education. It analyses and compares the development of distance learning and conditions of distance learning in different countries. It describes significant differences in the development of distance education in higher education in individual countries. The author stresses that we meet with various forms of implementation of distance education. The divergence in approaches towards distance education in different countries is caused by different cultural aspects, the tradition of distance learning, the development of information and communication technologies, and different legislative norms in the area of education. There are many types of different organisational models for distance education. A particular model might be dominant in one country, while in another country there may exist a variety of different organisational models for distance education. The article "Blended Learning Model for Computer Techniques for Students of Architecture," elaborated by Maria Helenowska-Peschke from Poland, summarises two-year experience of implementing a hybrid formula for teaching computer techniques at the Faculty of Architecture at the Gdańsk University of Technology. Original educational e-materials, consisting of video clips, text and graphic instructions, as well as links to online resources, are embedded in the university e-learning educational platform. The author discusses technical constraints associated with the creation of e-materials and their deposition on the Moodle platform, as well as associated didactic challenges, for instance the evaluation of students' skills and real time communication. In turn, Andrii Kostiuchenko, a Ukrainian author, presents the article "Features of Implementation of a Learning Management System in the Educational Process in a Ukrainian University." The issue of regulation of a learning management system at the state level of Ukraine is being considered in the article. Types and interpretations of electronic educational resources that can be used in distance education are pointed out. The Moodle environment, as an example of one of successful learning management systems, is considered. In particular, the article contains a list of roles that can be shared by users of a learning management system. The general structure of an e-learning course, which can be used by educational institutions, is also proposed.

Chapter III – "Methodological Aspects of E-learning and ICT Literacy Development" – includes two articles. The first article, "Contemporary Teacher

Competencies Development: A Study of ICT Tools for Professional Activities in Russia and Spain," is prepared by an international team of authors from Russia and Spain: Tatiana Noskova, Tatiana Pavlova, Olga Yakovleva, Prudencia Gutiérrez-Esteban, Rafael Martín Espada, Sixto Cubo Delgado, Juan Arias Masa, Gemma Delicado Puerto, Laura Alonso Díaz, and Rocío Yuste-Tosina. The paper studies the relations between teacher competencies and the specificity of the use of ICT tools in professional activities. The research was carried out within the frame of the IRNet project with the participation of two universities – the Herzen State Pedagogical University of Russia and the University of Extremadura, Spain. The results of the survey described give a general idea of various ICT tools use intensity in two countries. Overall, teachers take advantage of the electronic content capabilities for fostering students' motivation. They benefit from ICT tools' efficiency and performance, and they use cloud technologies for supporting networking and collaboration. Spanish teachers appear to be more active users of ICT tools. They apply LMS more intensively, together with own lectures recordings and foreign language e-resources. For facilitating students' communication, they apply discussion forums and online lectures intensively. For management, the most popular tools are electronic organisers, criterial rubrics, and online polls. The choice of e-resources that teachers use is largely based on their communication preferences and ways to manage teaching; these e-resources aim at facilitating learners' cognitive activities. As in the case of active use of LMS, the electronic system induces the application of available communication means (e.g., forums, online lectures, etc.) together with the appropriate management capabilities (e.g., electronic organisers, criterial rubrics, online polls, etc.). The results of the survey can help identify problem areas in teachers' ICT competencies. The article "Objectives and Content of the Mathematics E-learning Course Preparing Students for the School-leaving Exam in Mathematics" was prepared by researchers from Poland and the Czech Republic, Agnieszka Heba, Eugenia Smyrnova-Trybulska, and Jana Kapounová. The authors stress that information and communication technologies (ICT) can help solve the problems connected with forming mathematical competencies in students and are used in the process of teaching mathematics. The first part of the paper presents the theoretical background of the subject matter, including: the description of mathematical competencies and their identification at secondary school in Poland, Niemierko's taxonomy, the programmed learning theory, and the structure of the system of education/learning in the e-learning environment. It expresses the preconditions, expected results, concepts, objectives, hypotheses, and research methods. The practical part describes the structure of "Mathematics with Moodle," a system for individual learning based on the original authorial *MatLearn* module, and its graphic representation. A didactic tool is proposed – an e-learning course preparing students for the school-leaving exam in mathematics and improving students' mathematical competencies. Its aim is to increase the level of competencies, especially those which have not been mastered

yet. In order to construct study activities in the course, the programmed learning principles and Niemierko's taxonomy were used.

In addition, in the final chapter two reports are presented. The first one is prepared by an international team of researchers from different scientific areas connected with ICT, e-learning, pedagogy, and other related disciplines: Eugenia Smyrnova-Trybulska, Nataliia Morze, Piet Kommers, Tatiana Noskova, Paulo Pinto, Sixto Cubo Delgado, Martin Drlík, Josef Malach, Tomayess Issa, and Maryna Romanyukha. This article focuses on the objectives and some results of the international project IRNet. In particular, the article describes research tools, methods, and a procedure of the Work Package 5, that is, objectives, tasks, deliverables, and implementation of research trips in the context of the next stages and Work Packages of IRNet project – International Research Network. The final article is a report from the conference Di*stance Learning, Simulation and Communication (DLSC2017)*, organised by the University of Defence in Brno and held between 31 May and 2 June 2017, prepared by its organiser, Miroslav Hrubý. The *Distance Learning, Simulation and Communication (DLSC)* conference has been a part of an official accompanying programme of the International Exhibition of Defence and Security Technologies and Special Information Systems at the BVV Trade Fairs since 2009. The event is biennial. DLSC 2009, DLSC 2011, DLSC 2013, and DLSC 2015 proceedings are accessible at the DLSC conference website (http://dlsc.unob.cz). They have been indexed at the Web of Science database (https://apps.webofknowledge.com/). The electronic versions of all DLSC conference printed proceedings can be downloaded, and their use is free of charge.

We wish you pleasure and good inspiration reading this volume. Thank you!

Eugenia Smyrnova-Trybulska

I

Global Prospects of Distance Education and High-tech Electronic Learning Environment Design

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E-learning Specialists Training for IT Infrastructure of an Educational Institution Management

Abstract

The article discloses the possibility of training e-learning specialists to manage the IT infrastructure of educational institutions. The contents and results of lifelong learning competencies formation and professional competencies, skills, and soft skills in the course of "Managing the IT infrastructure of an educational institutions" are studied. Content training for specialists in e-learning is defined by such topics as "ICT policy and IT infrastructure of educational institutions," "Program and technical solutions for building IT infrastructure of educational institutions," "Using cloud technologies for IT infrastructure of educational institutions," and presented as an e-course that includes educational materials and competence tasks that form a competence for lifelong learning (communication in mother tongue, communication in foreign languages, knowledge of mathematics and general knowledge in the field of science and technology, skills in digital media, training for gaining knowledge, social and civic skills, proactive position and practical approach, awareness and self-expression in culture) and professional competence (in educational, technical, managerial, and project activities). The feasibility of using competency tasks to prepare specialists in e-learning is confirmed by educational achievements of 94 full-time and part-time students. What is analysed are the students' acquired soft skills (flexibility, teamwork, leadership, outgoingness, social skills, creativity).

K e y w o r d s: competence education, management of IT infrastructure, professional competence of e-learning manager, soft skills

Introduction

Research Issue

The development of information and communication technologies, and thus informatisation of education, contributes to the need to introduce the course "Managing the IT infrastructure of educational institutions" as an element of training not only managers of state and regional education bodies, but also students of pedagogical departments. Each teacher is the manager of learning, and within the knowledge society one is also an e-learning manager, able to design how to use or build the IT infrastructure of an educational institution and its information and educational environment to guide the learning activities of those one teaches.

De la Fuente and Vives (1995) determined that the IT infrastructure is a tool of regional educational policy. Most researchers of e-learning implementation pay attention to training students to use IT. For example, Keengwe and Kidd (2010) summarise the best practices of e-learning, while Baumgartner, Häfele, and Maier-Häfele (2004) examine the content management system of education in accordance with the development of ICT. Information Technology Infrastructure Library describes best practices worldwide in the organisation of the enterprise or unit that provides services in IT.

The use of ITIL library is implemented in higher education to train project managers and service managers for business.

Research Focus

Training a specialist in e-learning is considered for the most part as training an expert who has to pick up the tools for e-learning and is able to design an e-environment, but the manager needs an active stance, a holistic perception of ICT in the educational institution, and should define IT policy and its consequences, pick, design, and build an IT infrastructure depending on the educational process objectives. These requirements necessitated the study of the "Managing the IT infrastructure of educational institutions" course by pedagogy students in preparing them to be managers of e-learning.

The objective of the study is determined by the acquisition of lifelong learning and professional competencies, as well as soft skills in the course of "Managing the IT infrastructure of educational institutions" by managers of e-learning.

The hypothesis of the study is: training specialists in e-learning is of appropriate quality with the introduction of a training course on IT infrastructure management of an educational institution that forms competencies of lifelong learning, professional competencies, and soft skills of future teachers. The objectives of the study are:
 • the design of a course on IT infrastructure of educational institutions for the formation of competencies of lifelong learning, professional competencies, and soft skills;

- the use of competence tasks as a tool for forming lifelong learning competencies, professional competencies, and soft skills;
- the analysis of the "Managing the IT infrastructure of educational institutions" course introduction results in the preparation of students as managers of e-learning.

Methodology and General Background of Research

Let us define the study methods. Theoretical methods are: systematisation and comparison of scientific propositions, experiences in training specialists in e-learning to the management of educational institutions IT infrastructure; modelling to create competency problems for verification of the students' readiness for management of IT infrastructure of educational institutions. Empirical methods are: observation; questionnaires to determine the competence of lifelong learning, professional competencies, and soft skills of the students; content analysis of students' guidelines to the design and management of educational institutions IT infrastructure.

Soft Skills Formation in Specialists in E-learning Training

Lifelong Learning Competencies and Professional Competencies

The introduction of a competence approach in education contributed to a large number of studies on the subject in pedagogy and to the identification of general requirements for key competencies, competencies for lifelong learning, and students' professional competencies. For example, Winterton, Delamare – Le Deist, and Stringfellow (2006) defined conceptual approaches to competence training according to the experience of France and Germany. Jones and Voorhees (2002) disclose the models of competence formation in universities and other institutions, and define and sort the experiences of different types of educational institutions on the possibilities and methodology of competencies formation. The European Parliament and the EU Council recommended "Key competences for lifelong learning." Jochems, Koper, and Van Merriënboer (2004) summarised the trends of competencies development in connection with the introduction of e-learning, and identified the peculiarities of e-learning and the way to prepare for it.

Lifelong learning competencies

The recommendation of the European Parliament and of the EU Council "On the core competence for lifelong learning" of 18 December 2006 contains a list of eight core competencies: communication in the mother tongue, communication in foreign languages, knowledge of mathematics and general knowledge in science and technology, skills in digital media, training for gaining knowledge, social and

civic skills, initiative and practicality, awareness and self-expression in culture. They should be reflected in preparing students for professional life (Europeo, 2006). Let us consider the appropriatness of the "Managing the IT infrastructure of educational institutions" course for their formation through the preparation of e-learning managers.

Table 1.
Competencies formation through the "Managing the IT infrastructure of educational institutions" course

Core competencies	"Managing the IT infrastructure of educational institutions"
Communication in the mother tongue	The ability to study, compile, and implement domestic and foreign management experience in information technology and systems, IT infrastructure, etc.
Skills in digital media; knowledge of mathematics and general knowledge in science and technology	Competencies in IT infrastructure design, deep knowledge and content understanding, principles of organisation, teaching, hardware and software of educational process with the use of ICT; the ability to design the IT infrastructure of the educational institution; the ability to ensure interoperability in solving urgent problems of introducing ICT in school; competence in diagnostic, analytical, and advisory activities for the implementation of IT solutions; the ability to design and implement ICT in education process of different educational institutions (universities, secondary schools, primary schools) as well as the corporate sector
Training for gaining knowledge	Skills in organisation of individual educational, applied, and research activities
Social and civic skills	The ability to use the interaction skills in work, interpersonal skills, skills of productive communication as a parcel of professional activity
Initiative and practicality	The ability to utilise the theoretical and conceptual expertise in practice, teaching, and research work
Awareness and self-expression in culture	The ability to study and systematise achievements of national and foreign scholars in the field of ICT, pedagogy, psychology, and related areas

S o u r c e: Own work.

"Managing the IT Infrastructure of Educational Institutions" Course Description as a Content Groundwork for Professional Competencies Formation

The course "Managing the IT infrastructure of educational institutions" provides the students with competencies in the development and management of IT infrastructure of educational institutions. The objectives of the course are to provide students with theoretical knowledge about the peculiarities of IT infrastructure elaboration, and to form their categorical concepts for the design of the IT infrastructure and skills to create, update, and maintain IT infrastructure of educational institutions; students are encouraged to do active analytical and research work aimed at identifying effective ways of development and management of IT infrastructure of educational institutions.

The main topics of the course "Managing the IT infrastructure of educational institutions" are: "ICT policy and IT infrastructure of educational institutions," "Software and hardware solutions for building IT infrastructure of educational institutions," and "Using cloud technologies for IT infrastructure of educational institutions."

In the study of the "Managing the IT infrastructure of educational institutions" course the students should know:

- the essence of the IT infrastructure concept, its requirements, IT infrastructure objects typology;
- methods for identifying the information needs of the organisation, sources, and channels of information;
- principles and strategy for creation and development of information infrastructure;
- regulatory and scientific methods of management processes in information technology (IT) in school;
- structure, composition, objectives, and importance of IT infrastructure of educational institutions;
- key processes of IT infrastructure; methodology of construction and management of IT infrastructure of the edcational institution;
- classification and characteristics of hardware and software;
- recommendations of international standards for IT service management and ICT competencies of teachers; the main factors that determine the reliability and efficiency of information systems; and
- concepts and terminology in research, content, and basic forms of research activity.
    The students should be able to:
- determine the ICT policy of educational institutions;

- build models of IT infrastructure and identify peculiarities of IT infrastructure models for different types of educational institutions;
- identify technology, environment, and equipment for the implementation of ICT policies in educational institutions;
- define and improve the IT infrastructure of an educational institution, organise and manage the processes of formation, renewal, and development of information technology, information systems, information resources, model the information flow, and customise electronic document management system in an educational institution;
- perform formalisation of requirements for IT infrastructure of educational institutions; justify the choice of hardware and software IT infrastructure development of the institution; optimise IT processes; and
- identify the resources needed to ensure the reliability of information systems, use cloud technologies in education (software as a service (SaaS), platform as a service (PaaS), Infrastructure as a Service (IaaS)).
  Students' key professional competencies can be identified:
- in pedagogical activity (the ability to manage IT infrastructure at different levels of education in various educational institutions, including taking it into account when forming educational policy on the use of ICT, to provide a choice of effective ICT tools to create the conditions for individualisation of learning, including e-learning);
- in methodology (the ability to develop, implement, and summarise the experience and results of teaching models, methods, technologies, and training methods implementation with the help of different types of IT infrastructures);
- in management (the ability to study the state of the art and potential of ICT and to use a cluster of management methods of analysis and prediction of the results of IT solutions implementation using personnel, logistical, regulatory support in educational institutions of various types); and
- in project management (the ability to develop a pedagogical project of an educational institution IT infrastructure).

Soft Skills Formation

Gewertz (2007), John (2009), and others define the necessity of forming soft skills for the successful achievement of self-realisation and creativity in professional activities. Research of Robles (2012) determined top 10 soft skills that are most important to business leaders: integrity, communication, courtesy, responsibility, social skills, positive attitude, professionalism, flexibility, teamwork, and work ethic.

The course is aimed at developing both "hard" and "soft" skills and requires mandatory consolidation of students' behavioural models for daily use.

The degree of mastering soft skills is difficult to track, verify, and demonstrate. Therefore, in the course, soft skills formation is facilitated through the establish-

ment of educational tasks that make it possible for students to use a variety of behaviours, to holistically understand their own and common interests, to set priorities, and to make choices. Let us consider how soft skills can be cultivated through training managers of e-learning.

Table 2.
Soft skills examples, formation, and assessment methods

Soft skills	Formation methods	Assessment
Flexibility (adaptivity, ability to change)	Teaching practice in different types of educational institutions	Educational tasks fulfilment under different conditions
Team work	Project methods	The implementation of educational and research projects; participation in the creation of a common vision of IT policies for various types of educational institutions; the ability to perform various team roles; self-evaluation and evaluation of others
Leadership	Personal leadership – presentation of results, defending one's own point of view, creation of one's own electronic resources; social leadership – development of social projects, development of IT policies and IT infrastructure of educational institutions	Research projects development, development of IT solutions; development of guidelines for implementation of IT infrastructure in educational institutions, training of teachers during practice; workshops for teachers
Communication	Project methods	Online forums, blogs
Social skills	Problem solving through teaching practice	Seminars and workshops for teachers
Creativity	IT infrastructure development for different types of educational institutions according to their needs and capacity	Implementation of different resources, forms, and tools for creating new models of IT infrastructure

S o u r c e: Own work.

Competence Tasks Description

Morze, Barna, Vember, and Kuzminska (2015) determined that competence tasks combine knowledge and activity components, and ought to include the following stages: description of the problem situation content based on pre-viously acquired knowledge or personal experience of students; formulation of

requirements set for initial and boundary conditions for the process of learning activities; development of implementation criteria for phases of the assignment and the resulting product; development of assistance in the form of questions, tasks, or exercises aimed at the content specification described in a situation, specification of requirements, updating of basic knowledge, and activation of the association and causation needed to find ways to solve it; and development of guidelines for quality performance of certain tasks.

Hereby follow several examples of tasks to prepare students for IT infrastructure management of educational institutions.

Problem 1. Create guidelines for the implementation of software in the educational process and for the management of various types of educational institutions according to their ICT policy.
- Answer the following questions:
  ◦ What educational software can be used in an educational institution?
  ◦ What processes can be automated using ICT?
  ◦ Is there a standard of software implementation in educational institutions?
  ◦ What tools are necessary to automate the management of the institution, for educational use?
  ◦ What is the difference and what is common in software to be used in the educational process and for the management at a university, a secondary school, and a primary school?
- Fill out the chart (identify the software on your own, using hot links and personal experience):

Capacity	Software 1	Software 2	Software 3 etc.
Information flow			
Website design			
Communities			
Library repositories			
E-learning			
E-government			
Etc.			

- Basing on the table, develop guidelines for software implementation in different types of educational institutions (universities, secondary schools, primary schools). Upload the result as a file in the LMS platform.
- Evaluation criteria: "Software Capacity" table – 4 points; guidelines – 4 points; teamwork, communication, project presentation – 2 points. Total grade – 10 points.

Problem 2. You are a manager of e-learning at an educational institution that can spend 100 thousand UAH for the construction or improvement of its IT infrastructure. Provide IT solutions to build or improve the IT infrastructure and justify its feasibility, organisational and pedagogical conditions for its implementation. For example, if you decide to purchase multimedia systems, you have to find the manufacturers and compare prices and functionality. In the project describe goals and projected outcomes of IT solutions, and justify feasibility of certain assets. All offers need to be backed by links to the manufacturers' sites and evaluations of experts.

- Answer the following questions:
  - What results are to be obtained when implementing your solution?
  - What criteria did you follow to choose the tools? Have you considered the trends of ICT in their selection?
  - What should be included in expenses (repair, maintenance, software installation, payment for teachers, outsourcing, etc.)?
  - What are the organisational and pedagogical requirements for implementing your IT solutions?
  - What are the negative consequences of the implementation of your IT solution?
  - Describe the project and estimate the implementation of IT solutions.
- Examples: multimedia equipment of classrooms, introduction of e-learning (in distant form), introduction of e-learning (in blended form), organisation of a school newspaper issue, introduction of electronic journals and Web conferencing, creation of a remote school, purchase of office equipment, Wi-Fi connection to the assembly hall, etc.
- Evaluation criteria: project description (justification of relevance, objective, projected results, tools, organisational and pedagogical conditions of implementation) – 4 points; the budget estimate (taking into account all costs of purchase, service, maintenance, including the necessary staff, links to manufacturers, expert evaluation) – 4 points; team work, communication, project presentation – 2 points. Total grade – 10 points.

Data Collection and Analysis

The course of "IT infrastructure of an educational institution management" was within the framework of the "Manager of e-learning" curriculum Master degree programme. 92 students of the Borys Grinchenko Kyiv University students passed the course in the 2016-2017 academic year. 48 (52%) of those students were enrolled in a full-time course, and 44 (48%) – in an extra-mural course. For full-time students, the course comprised of 2 credits, for extra-mural studies – 4 credits due to the volume of time scheduled for individual learning.

Of the overall number of students, 32 (35%) passed the exam and took part in the survey. Two distance courses were created for different forms of study.

All students had the opportunity to take advantage of distance learning courses for more in-depth understanding of the course. For individual consultation and discussion topics of the course, a forum was implemented; 156 posts and 903 student tasks and projects were uploaded for full-time students, and 269 posts and 730 student tasks and projects were uploaded for extra-mural studies.

Results of Research

The analysis of practical works and projects showed that the tasks offered in the form of competence tasks were practice-oriented, and the students got the highest score. Extramural students needed more individual counseling with the course tutor.
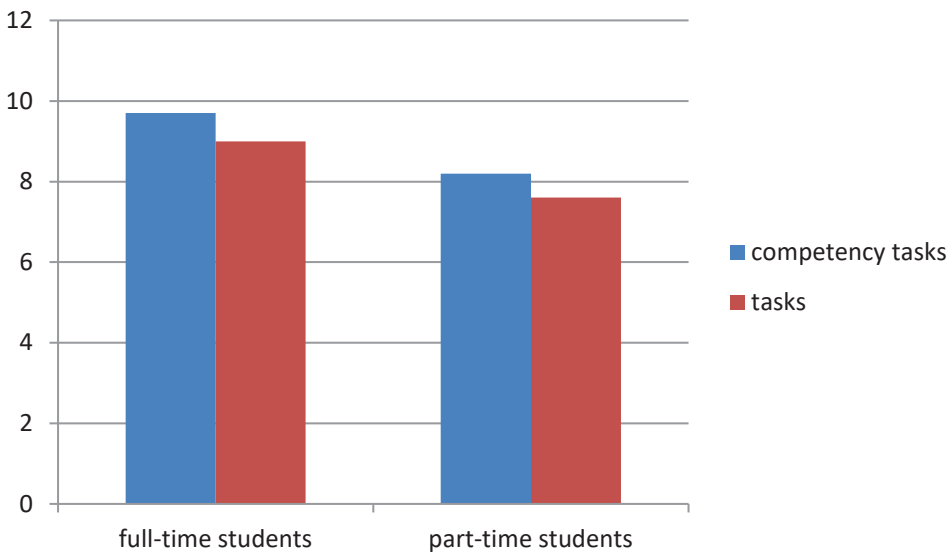
Figure 1. Grade point average for different types of tasks (max. 10 points).

S o u r c e : Own work.

The meaning of figures compared in the selections exceeds 10, which is why the nonparametric method Mann-Whitney has been employed. The experiment encompasses two selections of students – the full-time and the distance learning formats, N=48 and M=44 accordingly.

Having calculated the Mann-Whitney criterion for the reproductive problems results, we get U = 373. According to the calculations *Wemp* = 0.0338 < 1.96. The hypothesis of the selections coincidence is estimated at 0.05 of significance. Having calculated the Mann-Whitney criterion for the competence problems, we get *Wemp* = 2.1987 > 1.96. The efficiency of learning acquisition for full-time and distance form students coincide, while the competence tasks efficiency is different. Hence the conclusion may be derived that the full-time learning format is more suitable for the competence tasks training.

32 full-time students to have completed the course and passed the exam took part in a survey as to the course influence on skills formation. For the distance learning students, a credit pass was proposed based on the laboratory and applied tasks completion.
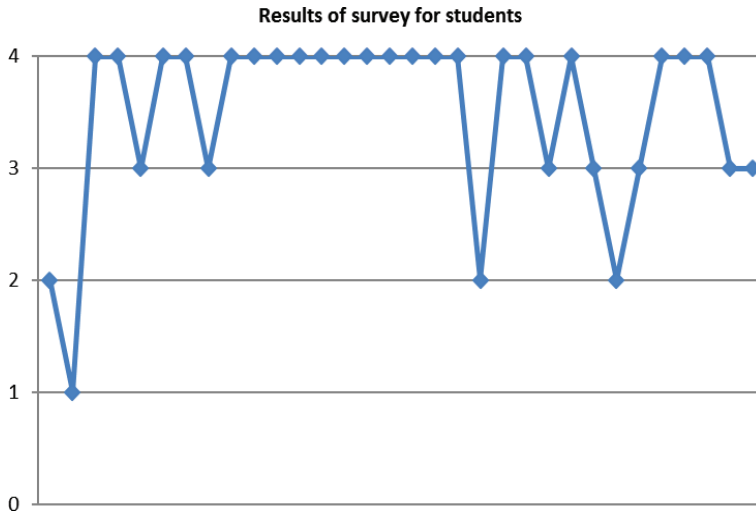
Figure 2. Students' assessment of the course impact on professional competencies and soft skills formation.

S o u r c e : Own work.
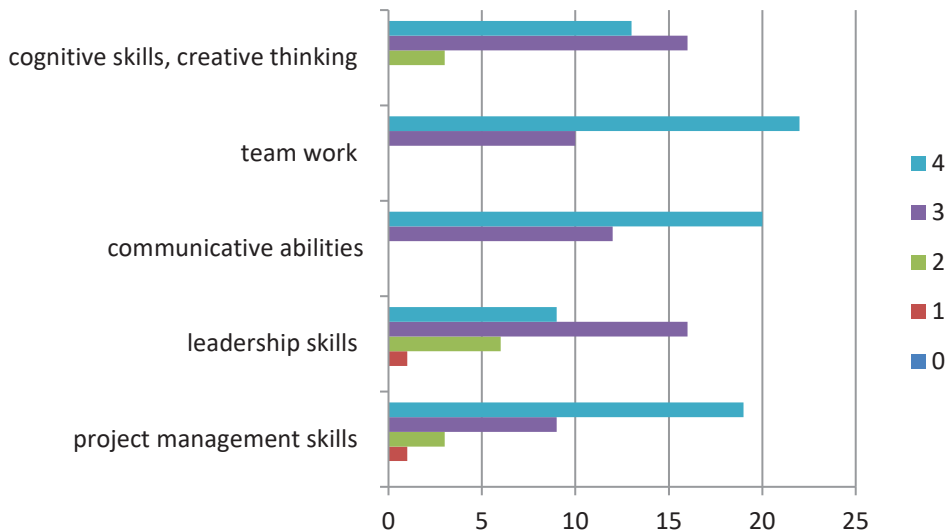
Figure 3. Frequencies of students' assessment of the course impact on soft skills formation (max. 4 points).

S o u r c e : Own work.

Discussion

Soft skills formation is possible if exercises and practical simulations are used, constantly enticing students to make independent decisions (to solve the competence tasks, develop and implement projects, to perform self-evaluation of their activities, and so on).

The feasibility of using competence tasks to prepare specialists in e-learning is corroborated by educational achievements of 94 full-time and extramural students. The extramural students demonstrated lower GPA (8.2) than students of full-time education (9.7), but interviews indicated greater interest in this form of knowledge assessment, based on their experience in educational institutions.

Conclusion

To perform the research tasks, we developed the structure of the "Managing the IT infrastructure of educational institutions" course and determined how it provided for the formation of competencies for lifelong learning (communication in the mother tongue, communication in foreign languages, knowledge of mathematics and general knowledge in the field of science and technology, skills of digital media, training for gaining knowledge, social and civic skills, initiative and practicality, awareness and self-expression in culture) and professional competencies (in educational, technical, managerial, and project activities); we also analysed the acquisition of soft skills by students (flexibility, team work, leadership, communication, social skills, creativity).

Students indicated the following most useful competencies acquisition activities:
- consultations with teachers (among others in the form of blogs and forums) (34.6%),
- educational technology project (33.2%),
- competence tasks solution (31.5), and
- independent research (0.7%).

The study results demonstrated that the tasks presented in a competence form enticed the students' interest for being practical and for presenting an opportunity to be creative and apply leadership skills, and provided for the overall successful study results.

The study does not cover all aspects of the abovementioned academic problem. The system of students competencies, and soft skills evaluation and self-assessment need further development and elaboration of appropriate diagnostics. The possibility of using the acquired competencies by specialists in e-learning in educational institutions of different types needs in-depth exploration to adjust the training programme for the management of an infrastructure of educational institutions.

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Szkolenia z zarządzania infrastrukturą IT w instytucji edukacyjnej skierowane do specjalistów w zakresie e-learningu

S t r e s z c z e n i e

Artykuł omawia możliwość zorganizowania szkolenia specjalistów w zakresie e-learningu, którzy mogliby zarządzać infrastrukturą IT w instytucji edukacyjnej. Porusza zagadnienia związane z rozwijaniem umiejętności uczenia się przez całe życie, kompetencji zawodowych oraz umiejęt-

ności miękkich i innych. Kurs taki powinien obejmować następującą tematykę: polityka związana z wprowadzaniem technologii informacyjno-komunikacyjnych w instytucjach edukacyjnych i infrastrukturach IT, program budowania infrastruktury IT i jej rozwiązania techniczne w instytucjach edukacyjnych, usługi w chmurze dla instytucji edukacyjnych. Mógłby to być kurs online zawierający materiały i zadania kształcące umiejętność uczenia się przez całe życie (dot. komunikacji w języku ojczystym, komunikacji w językach obcych, wiedzy matematycznej, wiedzy ogólnej w zakresie nauk ścisłych, umiejętności używania mediów cyfrowych, szkolenia na temat sposobów zdobywania wiedzy, kompetencji społecznych i obywatelskich, podejścia praktycznego i zachowania aktywnego, świadomości kulturowej i wyrażania siebie) oraz umiejętności zawodowych (edukacyjnych, technicznych, menadżerskich i projektowych). W artykule została pokazana możliwość stworzenia zadań kształcących różne kompetencje, jakimi muszą wykazywać się specjaliści w zakresie e-learningu, potwierdzona przez osiągnięcia edukacyjne 94 studentów uczących się w pełnym i niepełnym wymiarze. Zostały przeanalizowane umiejętności miękkie zdobyte przez studentów (elastyczność, praca zespołowa, zdolności przywódcze, kompetencje społeczne i towarzyskie, kreatywność).

S ł o w a   k l u c z o w e: kształcenie kompetencji, zarządzanie infrastrukturą IT, kompetencje zawodowe menadżera e-learningu, umiejętności miękkie

Nataliia Morze, Iryna Vorotnykova, Rusudan Makhachashvili

Подготовка менеджеров е-обучение в управление ИТ-инфраструктурой образовательных учреждений

А н н о т а ц и я

В статье раскрыты возможности подготовки менеджеров е-обучения для управления ИТ-инфраструктурой образовательного учреждения. Исследовано содержание и результаты формирования компетенций обучения в течение жизни и профессиональных компетенций, навыков soft skills в курсе «Управление ИТ-инфраструктурой образовательного учреждения». Содержание подготовки менеджеров электронного обучения определены темам «ИКТ политика и ИТ инфраструктура образовательного учреждения», «Программно-технические решения для построения ИТ инфраструктуры образовательного учреждения», «Использование облачных технологий для построения ИТ-инфраструктуры образовательных учреждений» представлен в виде дистанционного курса, содержащий учебный материал и компетентностного задачи, которые формируют компетенции для обучения в течение всей жизни (общение на родном языке; общение на иностранных языках, знание математики и общие знания в области науки и техники; навыки работы с цифровыми носителями, обучение ради получения знаний, социальные и гражданские навыки; инициативность и практичность, осведомленность и самовыражения в сфере культуры) и профессиональные компетентности (в области педагогической, методической, управленческой и проектной деятельности). Целесообразность использования компетентностных задач для подготовки менеджеров электронного обучения подтверждено результатами учебных достижений 94 студентов очной и заочной формы обучения. проанализировали получения soft skills студентами (гибкость, работа в команде, лидерство, комуникабильнисть, социальные навыки, креативность).

К л ю ч е в ы е   с л о в а: компетентность образование, управление ИТ-инфраструктура, профессиональные компетентности менеджера электронного обучения, мягкие навыки

Nataliia Morze, Iryna Vorotnykova, Rusudan Makhachashvili

Formación de especialistas en e-learning para infraestructuras de IT para la gestión de instituciones educativas

R e s u m e n

El artículo expone la posibilidad de formar especialistas en e-learning para gestionar las infraestructuras de TI en las instituciones educativas. Se estudiaron los contenidos y resultados de la formación de competencias de aprendizaje permanente y las competencias profesionales, habilidades, habilidades blandas durante la «Gestión de la infraestructura de TI de una institución educativa». La formación de contenidos para especialistas en e-learning está definida por temas como «La política de TICs y la infraestructura de TI de las instituciones educativas», «El programa y las soluciones técnicas para la construcción de infraestructuras de TI de las instituciones educativas» y se presenta como un e-curso que incluye materiales educativos y tareas de competencia que constituyen una competencia para el aprendizaje permanente (comunicación en idioma materno, comunicación en lenguas extranjeras, conocimiento de matemáticas y conocimientos generales en el campo de la ciencia y la tecnología, habilidades en medios digitales, capacitación para adquirir conocimientos, habilidades sociales y cívicas; posición proactiva y enfoque práctico, conciencia y autoexpresión en la cultura) y para la competencia profesional (en actividades educativas, técnicas, de gestión y para proyectos). La viabilidad de utilizar las tareas de competencia para preparar a los especialistas en e-learning se confirma a través de los logros educativos de 94 estudiantes a tiempo completo y a tiempo parcial. Se analizaron las destrezas transversales adquiridas por los estudiantes (flexibilidad, trabajo en equipo, liderazgo, sociabilidad, habilidades sociales, creatividad).

P a l a b r a s   c l a v e: Educación en competencias, gestión de infraestructuras IT, competencia profesional de gestión en e-learning, habilidades transversales

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Global Prospects of Distance Education

Abstract

Distance education conferences and publications have the longest tradition in Western world countries, where they are focused on introducing professional solutions into business and administration. In Asia, the implementation of distance education is linked to social development and global expansion of national business within the framework of government strategies. In Latin America and in Africa, distance education provides assistance in equalising educational opportunities and in promotion of peace. In post-communist countries, academic centres poorly cooperate with administration and business sectors, which offer competitive and most attractive distance education courses. Algorithmisation of distant education courses results in insufficient development of self-reliance, creativity, and empathy of employees.

K e y w o r d s: conference, publications, teaching, distance education (DE), business training, marketing, administration, global, society, journal, commercialisation

Prologue: Algorithmic Behaviour of a Remotely Trained Employee
To a mobile store of one of the Polish telecommunications companies, so called salon or showroom, located nearby the major train station, enters a client carrying a suitcase. A staff member, who automatically rises from his seat positioned behind the counter, says,
"Good morning, madam."
"Good morning, sir."
The client takes a seat opposite the employee, puts her smartphone on the counter, takes out her purse, and says,

"I would like to get 50 zlotys credit for this phone."
The staff member answers, following the rules he was taught during the company's training,
"First, I would like to ask for your ID, madam."
The client feels treated like in Figure 1 below.

Figure 1. The perception of a customer by employees of a large corporation trained in a remote course based on algorithms of customer behaviour.

S o u r c e: https://pixabay.com/pl/pi%C5%82ka-o-kabel-lan-po%C5%82%C4%85czony-563972.

Therefore, the client reacts to such a request with astonishment and indignation,
"For my ID? And what for? Until the end of last January, all the pre-paid phones had to be registered, so also my name was assigned to this phone! Otherwise, it would be disconnected until now. My personal data has already been collected by your company, sir."
The staff member does not give up the possibility of gaining the client's personal data and takes a different approach,
"In that case, I would like to ask you for your phone number, madam."
"But I do not want to receive any ads from your company, sir! Because I see no other reason why you would ask for my phone number. All I need is some more credit. I am in a hurry to catch a train, and I really do not have time or patience for anything else!"
The staff member does not give up on the possibility of collecting the client's personal data. He takes a critical approach in order to achieve the desired reaction of the client. In a low voice he says as if to himself, but loud enough for the client to hear,
"The phone must have been stolen from someone... Or found somewhere..."
However, the client is not provoked,
"Sir, all I am asking for is 50 zlotys credit. This is my phone. I will prove it to you by unlocking it. Here it is – the phone is unlocked!"

She turns the phone towards the staff member so he would be able to see the screen. The staff member, having found out that the company's personal data acquisition strategy is ineffective, proceeds to serving the client.
"Of course, I will be arranging additional credit or you in this instant."
He retrieves a remotely operated request form and asks the client professionally,
"Can I have a look at your phone, please?"
"Yes, of course."
The staff member gently picks up the client's phone. Then, he enters the code. Doing so, he holds the phone in such a way that the client can clearly see what is being done and rest assured that the staff member does not perform any other operations.
"Confirmation shall come in a second..."
A signal of an incoming message is heard.
"I think it has come. May I check?"
"But of course!"
The staff member opens the incoming messages' folder of the customer's mobile phone.
"Yes! Please have a look, madam: 'Credit amount 50 PLN. Available credit 55 PLN. Credit expires 2018-01-30 at 11.54:28 PM. Thank you'."
The customer smiles with gratitude, relieved. She puts 50 PLN on the counter taking her smartphone back.
"Thank you very much, sir!"
The staff member relaxes. He smiles in a well-practised way and says professionally,
"Thank you for your business, madam. Please visit our store more often. We are at your service."
When issuing a receipt, he does not give up on the possibility of gaining a new, although reluctant, client and adds routinely,
"Here is some information on our current promotions, madam. We will see you again soon!"
"Goodbye, sir."

History and Present-day of Studies on Distance Education

Studies on distance education (DE) have been conducted for over a half of a century, starting in 1963 (Childs, 1963). They cover a number of academic disciplines, technologies, cultural and economic contexts, and social determinants. They assist in offering effective education and in utilising the advantages of DE. University lecturers, professionals, businessmen, and administration staff representatives meet at numerous conferences, and some of those conferences have been held regularly for decades.

Western World

Conferences

DE conferences held regularly in the West, with the longest tradition and the greatest impact, include:

1. *Distance Teaching & Learning Conference* (*DT&L*), inaugurated in 1985, organised by Distance Education Professional Development, Division of Continuing Studies, and sponsored annually by the University of Wisconsin–Madison, USA. In 2017 this conference was held for the 32nd time from 25 to 27 July, like every year, in Madison. The organisers of those conferences offer the attending professionals pre-conference workshops, meetings with experts, presentation of practical strategies and techniques, discussions panels, working within groups of special interests, as well as certificates. Therefore, DT&L conferences aim at introducing academic solutions into the business sector ("Distance Teaching & Learning Conference," 2017).

2. *International Council for Open and Distance Education World Conference* (*ICDE*), organised for the first time in 1991 by the International Council for Open and Distance Education. It is held in various countries, and in 2017 it will take place for the 27th time, from 17 to 19 October, in Toronto, Canada. Students from 22 public universities and from 24 colleges, cities, and country residents are to participate in it, either personally or via the Internet; in total, there are expected more than 4 million participants ("International Council for Open and Distance Education," 2017).

3. *User Modeling, Adaptation and Personalization* (*UMAP*), also known as *User Modeling* or *Adaptive Hypermedia,* held regularly since 1986, in, for example, Honolulu (Hawaii), Dagstuhl (Germany), Hyannis (the USA), Montreal (Canada), and Dublin (Ireland). In 2017 it will be held for the 26th time, in Bratislava, Slovakia. This conference is addressed to researchers and practitioners working on customising systems to meet the needs of individual users or groups, as well as on collecting information about them. The organisational committee consists of academics, representatives of various companies and corporations (e.g., IBM, Yahoo, and Eurocom), non-government organisations and associations ("UMAP2017 Bratislava," 2017).

4. *OEB* (formerly: *Online Educa Berlin*), inaugurated in 1995 and organised professionally by the Integrated Communications Worldwide Events GMbH annually in Berlin, in December. Every year it is attended by more than two thousand European and global researchers, practitioners, professionals, producers, exhibitors, etc. ("OEB. Shaping the Future of Learning," 2017).

5. *International Conference on E-learning*, organised annually since 2007 by the International Association for Development of the Information Society (IADIS) and held in Lisbon. It covers technology as well as other topics such

as: platform management; data protection; multimedia games; user behaviour; professional, complementary, and domestic education; theories, strategies, tactics, and e-education models; designing DE courses; simulation and mo-delling; educational-entertainment, etc. The organisers represent countries such as: Austria, Bulgaria, Canada, Chile, China, Germany, the Great Britain, Greece, Italy, Lithuania, Mexico, Romania, Slovenia, Spain, Thailand, Ukraine, and the USA ("MCCSIS 2017...," 2017).

6. *International Conference on Computer Modeling and Simulation* (*ICCMS*), organised by New York Association for Computing Machinery. In 2017 this conference will be held for the 8th time, this time in Canberra, Australia. Its aim is facilitation in establishing contacts and cooperation between researchers, and computer modelling and simulation industry representatives. The organising committee brings together researchers from Australia, Bangladesh, China, Italy, Japan, Kuwait, Malaysia, Norway, Portugal, South Korea, Thailand, Taiwan, and the USA ("The Association for Computing Machinery…," 2017).

7. *Distance Learning Administration Conference*, launched in 2012, organised and sponsored by the University of West Georgia and the *Online Journal of Distance Learning Administration*. As its name suggests, it is addressed to all interested in administration, management, planning, and evaluation of distant education courses. Organisers include topics such as supporting DE consumers and their trainers, DE marketing, ethics, copyright, and challenges associated with preparation and delivery of DE courses ("DLA 2017...," 2017).

It can be concluded that for decades organisers of the most prominent DE conferences held in the Western world countries have been integrating academic, business, and public administration representatives interested in this topic. They focus on the implementation of professional solutions into DE, which can be useful for achieving its academic, didactic, marketing, and administrative goals.

Literature Review

Börje Holmberg argued that DE is "an emerging academic discipline" (1986, p. 25). He defined three research areas: consumers, media participation, and teaching methods, as well as systems (analyses, surveys) (Holmberg, 1986). Therefore, he looked at DE from the perspective of academic research.

Cristóbal Suárez Guerrero, on the other hand, presented DE "in four basic research contexts: pre-university, higher education, public administration and private enterprise" (2010, p. 74). He recognised gathering resources as the most spread purpose of Web 2.0 usage (p. 80). This means that the abovementioned entities had not been using teaching methods appropriate to DE, well-rooted in the relevant theories, but they had treated DE pragmatically to achieve *ad hoc* educational goals by learning by heart or training in routine behaviours.

Olaf Zawacki-Richter and Terry Anderson came to a similar conclusion after analysing 695 journal articles on DE published in high quality professional

journals. More than a half of those articles referred to learning and teaching, while "other important areas (e.g. costs and benefits, innovation and change management) were dreadfully neglected" (Zawacki-Richter & Anderson, 2014, p. 5). However, for the business sector those areas of research remain the most important ones. Therefore, it can be said that progressive commercialisation of DE, which becomes pragmatically oriented to attract potential consumers, is taking place. Corporations derive benefit from DE; thus, they are paving own ways of using DE, like a car in Figure 2 below.

Figure 2. Attractiveness of e-resources presents various threats.

S o u r c e: https://pixabay.com/pl/znak-drogowy-znak-drogowy-2460237/.

Academic research and DE applications are dynamically developed, but extensive research areas are neglected (democratisation of access, digital divide, global education market, institutional partnership, knowledge construction, impact of constructivism and connectivism, etc.); the dominant issues are the analysis of interaction, communication, instructional design and learner characteristics (Zawacki-Richter & Anderson, 2014, p. 5), and applied technologies. It is easier to research these areas due to abundance, availability, and algorithmic arrangement of research material.

Asia

Conferences

The history of Asian DE conferences is relatively short. Nonetheless, such conferences have an international impact and are often geared towards global cooperation, and at the same time are oriented towards practical, business, or educational goals.

1. *29th International Conference on Teaching, Education and Learning* (*ICTEL*) in Bangkok (Thailand), scheduled for 22–23 December 2017, organised by

the International Association for the Development of Teaching and Learning based in India. The Association aims at advancing knowledge and the society through research and dissemination of information. ICTEL conferences in 2017 and 2018 are to be held, for example, in Bali, Dubai, Kuala Lumpur, Lisbon, London, Mauritius, and Singapore. Topics include, for example, blended learning, DE, and e-learning ("Association for the Development of Teaching, Education and Learning," 2017b).

2. *9th International Congress on New Trends in Education* (*ICONTE*) in Antalya (Turkey), scheduled for 10–12 May 2018. ICONTE congress is organised by Çözüm Educational Institutions (Turkey), Rollins College (USA), as well as *International Journal on New Trends in Education and Their Implications*, *Global and Local Distance Education*, *Journal of Educational and Instructional Studies in the World*, *Journal of Research in Education and Teaching*, and *International Women Online Journal of Distance Education*. The number of journals sponsoring the congress shows the widespread interest in the problem. The Research Committee of ICONTE congress is formed by representatives of universities from across the globe ("ICONTE," 2017).

3. *8th International Conference on Distance Learning and Education* (*ICDLE*), organised by the Singapore-based International Association of Computer Science & Information Technology. In the past it was held in Puerto Rico, Singapore, Hong Kong, Paris, Geneva, and Hatfield, and in 2017 it will be held in Barcelona. The ICDLE conferences aim at presenting the latest research, ideas, and solutions and promoting global cooperation between researchers and business representatives. Organisers and participants of ICDLE conferences represent, among others, Australia, Brazil, Canada, China, India, Iran, Japan, Malaysia, Romania, Singapore, Spain, Taiwan, Thailand, United Arab Emirates, the USA, and the United Kingdom ("ICDLE 2017," 2017).

4. *4th International Conference on Education and Distance Learning* (*ICEDL*), taking place annually from 2015 in Colombo (Sri Lanka), scheduled for 2018. It is organised by Sri Lankan Global Academic Research Institute. The goal of this conference is to create a communication platform for academic researchers, professionals, web administrators, educators, and business and student repre-sentatives. Due to Sri Lankan short research tradition, topics proposed by the organisers include blended learning, business, digital, distance, higher, mobile, and international education, as well as multimedia in DE. Participants of ICEDL conferences represented Germany, India, Sri Lanka, Turkey, and the USA ("4th ICEDL…," 2017).

5. *3rd International Congress on Education, Distance Education and Educational Technology* (*ICDET*) in Antalya (Turkey), scheduled for 24–25 December 2017, organised by Istanbul-Aydin University, United Distance Education for Eastern Europe, Western Asia and Northern Africa, as well as *International Journal on New Trends in Education and Their Implications*, *Global and Local*

Distance Education, *Journal of Educational and Instructional Studies in The World*, *Journal of Research in Education and Teaching*, *International Women Online Journal of Distance Education* ("ICDET...," 2017).

6. A modern DE conference is organised annually by the Distance Education Center of the China Ministry of Education and scheduled for 27 October 2017. It aims at summarising experience in DE and the past year in online education, as well as standardising school online education and exchanging experiences. The conference is attended by leading school teachers from different provinces, and representatives of online teaching centres ("远程教育会议通知," 2017).

Summarising, it can be said that Asian DE conferences set precise, pragmatic goals. Organisers of those conferences approach new technologies as a potential gain of the entire society, in a manner characteristic to collectivist cultures (G. Hofstede, G. J. Hofstede, & Minkov, 2010, pp. 100–144). Therefore, these conferences are sponsored by the governments, which takes advantage of them to develop competitive economies and promote education. These conferences meet with great interest, also abroad, and promote cooperation between different entities. The cooperation is indeed global, covering Asian economic powers as well as the Western world and the Latin American countries.

Literature Review

DE research develops especially in the business sector in countries specialising in the production of technologically advanced electronic devices and providing technologically advanced services. Taiwanese researchers "put more effort into practical studies of business training, while international authors focus on the users' psychological reaction to learning context" (Chen & Lien, 2011, p. 867). This conclusion was formed after analysing papers on DE published in Taiwan between 1996 and 2009. Research focused not on students, but on employees and business entities. Attention was paid to the effectiveness of the business model of education. Researchers proposed "to apply e-learning experiences into business training and observed the effects of business with e-learning environments" (Chen & Lien, 2011, p. 867). This research shows the attentiveness of researchers to the needs of the technologically developing country where *Acer* and *Asus* products are made. Approximately 80% of Taiwanese people have the Internet access, so its use in business education seems to be obvious.

Also in the South Korea (the Republic of Korea), corporate DE has been developed for decades. As Cheolil Lim explains, thanks to DE "the government took initiative to transform the state into an information-based society" (2007, p. 1). The government finances simulative technical skills trainings and DE programmes for employees, and the Ministry of Labour assures the quality of such education. Korean researchers recognise that "corporate e-learning should be guided both by governmental support and by company initiative" (2007, p. 1). The most often researched DE topics in the South Korea have become: preparation of courses

(42.3%), learners' support (23.1%), and costs (15.4%). One of the reasons for such research interest is desire of many older employees to learn working efficiently in corporations such as Samsung or LG. Their training focuses on acquiring basic, practical information. Their training, however, lacks DE focused on development of competencies and skills, based on, for example, problem solving or case studies.

It can be concluded that in Asia, cultivating its traditional culture, DE promotes the country's dynamic economic development and strengthens global competitiveness of the Asian business environment. New technologies are based on traditional culture as shown in Figure 3.

Figure 3. In Arab world, mobile technologies are used for Islamic studies and education of teachers.

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Latin America and Africa

Conferences
1. IX *Conferencia Internacional Guide. Educación y sociedad en red. Los desafíon de la era digital*, held in Buenos Aires (Argentina) in 2015, organised by Programa de Educación a Distancia Universidad del Salvador, Argentina, and Universitá degli Studi Guglielmo Marconi, Italy. Speakers from 30 countries (e.g., from Germany, the Great Britain, Italy, countries of Latin America, Spain, Saudi Arabia, Turkey, and the USA) presented their research results, along with discussing some modern technologies and business education issues. Problems related to digital inclusion, access to online education, and utilisation

of modern and social media in education were also addressed ("IX Conferencia International Guide…," 2017).

2. *Importancia de la información y la comunicación para el aprendizaje a distancia: el uso adecuado de las technologias*, organised in 2014 for the first year students from the Universidad Nacional Autónoma de México by Sistema Universidad Abierta y Educación a Distancia. This conference met with great interest, also among students from other Mexican universities and from abroad, especially by those enrolled in DE courses (M. Guerrero, 2013).

3. *21ˢᵗ International Conference on Teaching, Education & Learning* (*ICTEL*), held in Port Louis, Mauritius in 2017, organised by the Indian Association for the Development of Teaching and Learning. Topics included blended learning, DE, and e-learning. Previous ICTEL conferences were held, among others, in Bali, Bangkok, Barcelona, Dubai, Hong-Kong, Istanbul, Kuala Lumpur, Lisbon, London, Rome, and Singapore ("Association for the Development of Teaching, Education and Learning," 2017a).

4. *International Conference Integrating Mobile Learning to Open up Access to Quality Education and Training Opportunities in Africa*, organised by the African Virtual University and held in Nairobi (Kenya) in 2016. The topics covered narrowing gaps in educational opportunities and increasing access to free education, which becomes more accessible by the utilisation of DE and especially by the application of mobile technologies in distance education ("African Virtual University," 2017).

5. *5ᵗʰ ACDE Conference and General Assembly* held in Khartoum (Sudan) in 2017, organised by the African Council for Distance Education (ACDE) and the Open University of Sudan. The organisers recognise the impact of DE (including open educational resources and free access to DE courses, e.g., ODL and MOOCS) on conflict resolution and peace promotion in Africa. Academic researchers, administrators, managers, and students are encouraged to cooperate across the entire continent. The purpose of the conference is to provide digital education in the face of the *mounting need for sustainable education for the knowledge economy* ("African Council for Distance Education," 2017, p. 6).

Literature Review

The analysis of Spanish language DE publications conducted by Julio Cabero-Almenara, Verónica Marín-Díaz, and Begoña E. Sampedro-Requena (2016) showed that DE in Spanish-speaking cultural circles, above all, democratises the educational process. Therefore, academic effectiveness, learning and teaching styles, and user interactions were studied. Topics related to the assessment of students were, however, hardly ever undertaken and if yes, they were undertaken only descriptively (Cabero-Almenara, Marín-Díaz, & Sampedro-Requena, 2016, p. 13).

In Africa, on the other hand, availability and functionality of e-resources, efficiency of technical platforms, and issues related to the use of electronic tools

or resources were researched (Ajegbomogun, Okunlaya, & Alawiye, 2016). Most respondents from the National Open University of Nigeria identified e-resources as easily accessible and useful in studying, while the problems encountered were power outages and server failures (Ajegbomogun, Okunlaya, & Alawiye, 2016).

Therefore, it can be said that topics of DE conferences as well as publications in Spanish and African languages reflect the level of technical advancement and educational needs of developing countries. Figure 4 below reflects that computer technologies are being assimilated by adults.

Figure 4. Students in African countries found available DE resources useful equally online and offline.

S o u r c e: https://pixabay.com/pl/burzy-m%C3%B3zg%C3%B3w-burza-m%C3%B3zg%C3%B3w-biznesu-2449730/.

Post-communist Countries

Conferences

Regularly held DE conferences include:

1. *Uniwersytet Wirtualny* [*Virtual University*], held annually in Warsaw, inaugurated in 2001 and organised by the Warsaw University of Technology, the University of Warsaw, the Warsaw University of Life Sciences, and Polish-Japanese Academy of Information Technology. This conference aims at

researching the utilisation of DE in different types of schools. The analysis of the conference programme shows that in 2017 conference participants represented only universities and schools; there were no representatives of business or administration entities attending the conference. Topics included: new trends in e-education in Poland, in Europe, and in the world; e-teaching at schools, in universities, and in companies; sociological, pedagogical, and psychological aspects of e-education; educational portals; e-education platforms; virtual laboratories; applications of multimedia and artificial intelligence in e-education; e-education in continuous and life-long learning; electronic management of knowledge at universities ("Uniwersytet Wirtualny. Model. Narzędzia. Praktyka," 2017).

2. *Distance Learning in Applied Informatics* (*DIVAI*), organised by the Faculty of Natural Sciences of Constantine of the Philosopher University in Nitra and by the Faculty of Science, University of Hradec Králové, the Czech Republic, held periodically since 2003 (in 2016 it was held for the 10th time). Topics include technology, social media, pedagogy, databases and their analysis, and meta-knowledge. Members of the Organising Committee and conference participants represent Austria, Azerbaijan, Belgium, Brazil, the Czech Republic, the Great Britain, Hungary, Italy, Lithuania, Poland, Russia, Serbia, Slovakia, South Africa, Ukraine, and the USA ("DIVAI 2016…," 2016).

3. *9th Annual International Scientific Conference Theoretical: and Practical Aspects of Distance Learning* (*DLCC* 2017) in Cieszyn (Poland), inaugurated in 2009, organised annually by prof. Eugenia Smyrnova-Trybulska at the University of Silesia, the Faculty of Ethnology and Education. Due to Cieszyn's cross-border location, not only Polish researches readily attend this conference but also Czech and Slovakian ones. The conference is also attended by participants from Austria, Portugal, the Netherlands, Ukraine, Russia, the United Kingdom, Sweden, Australia, Peru, and Turkey. Conference participants represent a range of universities, academic centres, academic disciplines, DE platforms, and academic journals. The atmosphere of conference held on a regular basis in a small conference centre is conducive to establishing contacts necessary for undertaking international projects ("9th Annual International Scientific Conference…," 2017).

4. *Distance Learning, Simulation and Communication* conference at the University of Defence in Brno, the Czech Republic, organised biannually. It was held for the first time in 2009 in a military university. At this university the Internet is utilised, among others, for training soldiers in operating navigational and aeronautical devices and military vehicles, or for emergency response training. The conference brings together researchers (mostly military ones) from countries of the former socialist block but also from Austria, Canada, Iran, Italy, and Syria. This is the only military conference of this type held in Central Europe. These conferences are organised by Miroslav Hrubý Csc,

an employee of the Department of Communication and Information Systems [Katedra Komunikačních a Informačních Systémů] at the Faculty of Military Technologies [Fakulta Vojenských Technologií] (Hrubý, 2017).

5. *Kongres Edukacji Pozaformalnej* [Semi-Formal Education Congress], held in Łódź (Poland), for the second time, in 2016. It brought together "350 owners, managers and representatives of the training industry [as well as] invited guests, partners, sponsors, exhibitors and media representatives" ("2 Ogólnopolski Kongres Edukacji Pozaformalnej…," 2016).

6. *ElForum'17. ELearning Forum in Russia 2017*, the first distance business and marketing education event in Russia (*eLearning-индустрии*). The topics covered online training for managers, salespeople, distributors, and customers, as well as promoting products to increase sales, building trust, and enhancing loyalty in customers, dealers, and partners ("ElForum'17…"). More than 400 participants from Belarus, Kazakhstan, Russia, and Ukraine attended the conference.

On the basis of presented information, one can draw a conclusion that DE conferences held in post-communist countries, unlike those in the Western countries, have a much shorter tradition and are either academic or business oriented. The split into these two different groups is very clear. Universities organise their own conferences, while the third sector (non-governmental), business, and administrative entities hold separate meetings and trainings. There is a lack of cooperation between universities and other entities. However, cooperation could result in a successful implementation of innovative didactic solutions, development of creativity and independent thinking, or even development of key competencies and team working skills in business and administration.

In a situation of underinvestment in higher education, the business sector offers more attractive, more accessible, and more appealing solutions to its potential users. This situation reflects the problems of developing countries of the post-communist bloc. Their identity has recently been weakened by the invasion of Western corporations, which are interested in a particular market success rather than in the long-term development of employees, or even less in the economic boom of the region.

Literature Review

In the post-communist countries, dynamically developing *content marketing* plays a specific role. Similarly to *copywriting*, *content marketing* is a strategy of creating relevant and thematically consistent content gaining attention of Internet users (i.e., potential consumers), aiming at the better positioning of the Internet site and gaining new customers. Marketing content is often educational. In the post-communist countries, where the media market is often dominated by western corporations, educational content standardised by those corporations serves commercial, non-educational purposes, because it becomes extras for

commercials. At the same time, service providers offer the sale of diplomas. This situation threatens not only the quality of education but also national culture, and as a consequence national sovereignty is under threat (Ślósarz, 2015).

DE publications, especially on DE utilising social media, demonstrate the division of environments and are either of an academic (e.g., Kubiak, 1997; Bednarek & Lubina, 2008; Pryszmont-Ciesielska, ed., 2011; Polańska, 2013) or of a marketing nature (Gdańska Akademia Bankowa et al., 1999; Bonek & Smaga, 2013; Fidelman, 2014; Lupa, 2016). Separating academic conferences from business ones results, for example, in the inadequate focus on costs of preparation of DE courses in academic research. The lack of funding for new technologies entails lowering the level of academic DE. It becomes unattractive if compared to business offers which appear on the market, including the educational market. Magdalena Roszak, PhD, who organises remote courses for students, has calculated and presented the cost of their preparation during the conference *Distance Learning, Simulation and Communication* conference in Brno. 2 June 2017 (see Figure 5).
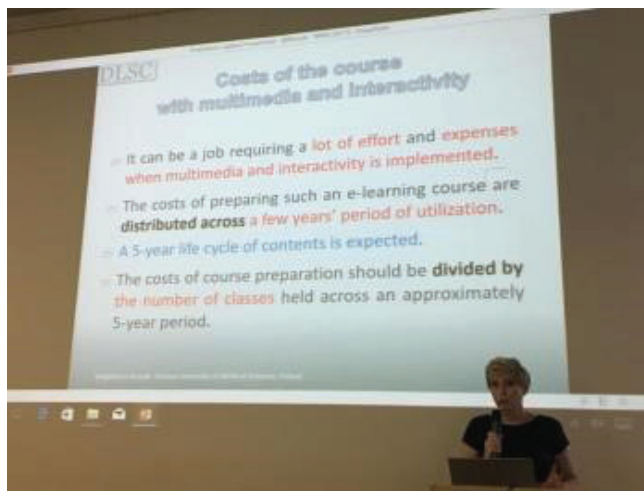
Figure 5. Magdalena Roszak, PhD, presenting the costs of preparing an interactive multimedia course. Photo by Anna Ślósarz.

Intercultural Differences

DE conferences, publications, and improvements which take place in Western countries include using advanced technologies for institutional, government, and business projects. In particular, they cover teaching, mandated by technological advancement, with the use of the Internet by working in *Cloud*, content personali-

sation, adaptation of the system to the learner's behaviour (Klašnja-Milićević, Vesin, Ivanović, Budimac, & Jain, 2017), and the role of semantic Internet in education.

Western, Latin American, and African conferences and publications address mainly higher education; however, they function in the realities of economical and societal advancement. Asian ones, on the other hand, are closely related to governmental policy and synergic advancement of the national business sector. This is in line with the collectivist nature of these societies (Hofstede et al., 2010, p. 126).

There is a lack of such pragmatic cooperation of different environments in the post-communist countries, in which recent monopoly of the state has been replaced by corporations (Pawełczyńska, 2010, p. 163). Societies are atomised there, and the level of social trust is very low, which makes such cooperation even more difficult.

Conclusions

Business and administrative entities, implementing modern DE technologies, have started competing with academic community by creating functional and attractive courses. Companies producing software and digital equipment, needed for DE, and offering services in this area have emerged. They benefit from the profitable sales market created especially for corporations, business, and governmental entities. Their separation from pedagogical, didactic, and academic environments does not serve the long-term development of modern teaching methods. A pragmatic orientation towards modern technology, a focus on reduction of education costs, and subordination to the requirements of corporate efficiency (see Prologue) result in the insufficient development of independent and creative thinking of employees participating in trainings offered by their employers. Algorithmic introduction of an employee / telemarketer / salesperson to respond to a client's behaviour in order to maximise profits of a company / corporation is a perfect example of capabilities of a computer running in DE, by its nature predetermined to programmed teaching in which various cybernetic models and behavioural variants are practised (Okoń, 1987, p. 236), but not so much critical use of information. Similarly, programmed teaching does not propagate integration of knowledge, competence training, or development of sensitivity, empathy, and creativity.

In teaching, not the "technical equipment, but the learning process itself consciously led by a pedagogue" (Okoń, 1987, p. 236) is the most important. High or even stunning technological advancement of hardware alongside with dubious quality of software, for example, computer programmes, teaching methods, and

pedagogical qualification of trainers, leads to mechanical (learned and practised) behaviours of programmed workers, their superficial interpersonal contact, and a lack of holistic understanding of a customer / client / patient. This is a problem that can be already observed in everyday life – not only in situations similar to one presented in Prologue.

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Anna Ślósarz

Globalne perspektywy nauczania na odległość

S t r e s z c z e n i e

Konferencje i publikacje na temat e-learningu mają najdłuższą tradycję na Zachodzie, gdzie ukierunkowane są na wdrażanie profesjonalnych rozwiązań do biznesu i administracji. W Azji wdrażanie nauczania na odległość powiązane jest z rozwojem społecznym i globalną ekspansją narodowych biznesów w ramach rządowych strategii. W Ameryce Łacińskiej i Afryce e-learning stał się narzędziem wyrównywania edukacyjnych szans i budowania pokoju. W krajach postkomunistycznych ośrodki akademickie nie współpracują z administracją i biznesem, który wprowadza konkurencyjne, bardziej atrakcyjne szkolenia. Ich algorytmizacja skutkuje niewystarczającym rozwojem samodzielności, wyobraźni i empatii pracowników.

S ł o w a   k l u c z o w e: konferencja, publikacje, nauczanie, kształcenie na odległość, szkolenia biznesowe, marketing, administracja, globalny, społeczeństwo, czasopismo, komercjalizacja

Anna Ślósarz

Глобальные перспективы дистанционного обучения

А н н о т а ц и я

Конференции и публикации по вопросам дистанционного обучения имеют давнюю традицию в странах запада, где они ориентированы на внедрение профессиональных решений в бизнес и администрирование. В Азии внедрение дистанционного обучения связано с социальным развитием и глобальным расширением национального бизнеса в рамках правительственных стратегий. В Латинской Америке и в Африке дистанционное обучение помогает в выравнивании образовательных возможностей и в содействии миру. В посткоммунистических странах академические центры недостаточно сотрудничают с административными и деловыми секторами, которые предлагают конкурентоспособные и наиболее привлекательные курсы дистанционного обучения. Алгоритмизация курсов дистанционного обучения приводит к недостаточному развитию уверенности в себе, творчества и сочувствия сотрудников.

К л ю ч е в ы е   с л о в а: Конференции, публикации, обучение, дистанционное обучение, бизнес-обучение, маркетинг, администрирование, глобальное, общество, журнал, коммерциализация

Anna Ślósarz

Perspectivas globales de la educación a distancia

R e s u m e n

Los congresos y publicaciones de educación a distancia tienen una larga tradición en los países del mundo occidental, que se centran en la introducción de soluciones profesionales en los negocios y la administración. En Asia, la implementación de la educación a distancia está vinculada al desarrollo social y a la expansión global de los negocios nacionales en el marco de las estrategias gubernamentales. En América Latina y en África, la educación a distancia ayuda a igualar las oportunidades educativas y a promover la paz. En los países postcomunistas, los centros académicos cooperan poco con la administración y los sectores empresariales, los cuales ofrecen cursos de educación a distancia más competitivos y atractivos. La algoritmización de los cursos de educación a distancia produce un desarrollo insuficiente de la autodependencia, de la creatividad y de la empatía de los empleados.

P a l a b r a s   c l a v e: congresos, publicaciones, enseñanza, educación a distancia, formación empresarial, marketing, administración, global, sociedad, publicación, comercialización

II
Models of Distance, Blended, and E-learning

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Models of Distance Learning in Higher Education

Abstract

This article is focused on distance learning in higher education. It analyses and compares the development of distance learning and conditions of distance learning in different countries. It describes significant differences in the development of distance education in higher education in individual countries.

We meet with various forms of implementation of distance education. The divergence in approaches towards distance education in different countries is caused by different cultural aspects, the tradition of distance learning, the development of information and communication technologies, and different legislative norms in the area of education.

There are many types of organisational models for distance education. A particular model might be dominant in one country, while in another country there may exist a variety of different organisational models for distance education.

K e y w o r d s: open university, distance education, electronic system, life-long learning, organisational models for distance education

Introduction

Nowadays, labour market needs more people with higher level qualifications. However, combining work, family responsibilities, and study requirements is very difficult. So, universities are solving this problem by using e-learning. Distance

learning increases an access to education for people who otherwise cannot attend higher education (Zormanová, 2016).

Organisational Models for Distance Education

There are many types of organisational models for distance education in different countries. One model might be dominant in one country, while that which might be characteristic of another country is a mixture of co-existing models, for example a large single mode institution and a number of independent dual mode institutions (Ganor, Gil´ad, Guri-Rosenblit, Ovsyannikov, Shelley, & Zaparovanny, 2000).

We know various models of distance education. The appearance of distance education in different countries is caused by different cultural aspects, political structures, different educational systems, different legislative norms in the area of education, the tradition of distance learning, the development of ICT, and the population density of the country (Hampl, Česal, & Vaškovic, 2008).

Single Mode Model

Universities which use this model provide only distance education; in these institutions distance education is the sole activity (Moore & Kearsley, 2012). This model is typical of open universities. It is characteristic of large national institutions which specialise in distance learning of all levels.

What is characteristic of this model is that the curriculum, the tools used in teaching, student support, and accreditation are designed to suit students studying at a distance form of education. The staff, devoted only to distance education, are interested in developing distance education methods. Although teachers do not demand face-to-face teaching because there are no on-campus student activities, sometimes we also encounter a regional network of study centres where students and tutors occasionally meet for consultation. These universities may have high setting-up costs, but their unit costs per student are generally lower than in traditional universities. Such institutions are supported by public finances.

This model is now realised in different European countries and is also very popular in Asia and Africa. There are famous open universities or single mode institutions all over the world. The Indira Gandhi National Open University in India (IGNOU) and Sukhothai Thammathirat Open University (STOU) in Thailand can be mentioned here.

Table 1.
Open universities

Name of university	Country
Aalto University Open University	Finland
Al Quds Open University	Palestine
Allama Iqbal Open University	Pakistan
Arab Open University	Kuwait, Oman, Egypt, Lebanon, Bahrain
Bangladesh Open University	Bangladesh
Dr. B.R. Ambedkar Open University / Andhra Pradesh Open University	India
FernUniversität in Hagen	Germany
Global Open University	India
Hellenic Open University	Greece
Indira Gandhi National Open University	India
Laweh Open University College	Ghana
Nalanda Open University	India
National Open University of Nigeria	Nigeria
Odisha State Open University	India
Open University	The United Kingdom
Open University in San Francisco State University	The USA
Open University of Hong Kong	China
Open University of Israel	Israel
Open University Malaysia	Malaysia
Open University of Mauritius	Mauritius
Open University of Sri Lanka	Sri Lanka
Open University of Tanzania	Tanzania
Open University of the Netherlands	The Netherlands
Sukhothai Thammathirat Open University	Thailand
Tamil Nadu Open University	India
The Open University of Japan	Japan
Universidade Aberta	Portugal
UP Open University	The Philippines
Uttarakhand Open University	India
Vardhman Mahaveer Open University	India
Venkateshwara Open University	India
Wawasan Open University	Malaysia
Yashwantrao Chavan Maharashtra Open University	India
Zambian Open University	Zambia
Zimbabwe Open University	Zimbabwe

S o u r c e: Own work.

Open University Characteristic: Open University in the United Kingdom

Great Britain is famous for its Open University. It is the largest open university in the world. It was the world's first successful distance open university.

Its headquarters are situated in Milton Keynes. Except its headquarters, the Open University consists of thirteen regional offices throughout the UK and nearly three hundred study centres.

The Open University was founded by Royal Charter in 1969 as an independent institution authorised to confer its own degrees. It was founded by the Labour government of Harold Wilson, who was its strong advocate. The University was established to allow quality distance education to people who could not regularly attend higher education. Nowadays, according to the National Student Survey, 92% students are satisfied with the quality of education ("The Open University").

For admission to undergraduate courses students need not have any educational qualification, but they must be residents in any of the countries with which a formal agreement has been signed. The Open University offers three types of programmes: undergraduate, postgraduate, and other areas of lifelong learning. There are eight faculties and schools: Faculty of Arts & Social Sciences; Open University Business School; Open University Law School; Faculty of Science, Technology, Engineering and Mathematics; Faculty of Wellbeing, Education and Language Studies; Institute of Educational Technology; Knowledge Media Institute; and Centre for Inclusion and Collaborative Partnerships. It is also the largest European educational institution that confers an MBA degree. The Open University has the largest number of disabled students among universities in Europe, including mental health issues ("The Open University").

Open University Characteristic: FernUniversität in Hagen (Germany)

The German model is characterised by its *Fernstudium*, which means the distance university level courses. The institutions which realise *Fernstudium* can also provide programmes of *Fernunterricht*, which means distance training.

The FernUniversität in Hagen is the only distance teaching university in the German-speaking countries and regions maintained by the state. The FernUniversität has more than 30 centres within Germany, Austria, and Central and Eastern Europe. It offers two types of programmes: undergraduate and postgraduate with high-quality final degrees (Bachelor, Master, and Doctorate). There are four faculties: Faculty of Humanities and Social Sciences, Faculty of Mathematics and Computer Science, Faculty of Business Administration and Economics, Faculty of Law ("EADTU…," "FernUniversität in Hagen").

The FernUniversität is encouraged and regulated by the Ministry of Education, because it is one of the characteristics of a German single mode model. In Germany, the distance form of studies is regulated by the Student Protection Act, which protects students at distance learning programmes (Owusu-Boampong

& Holmberg, 2015; Kommers, Smyrnova-Trybulska, Morze, Tomayess Issa, & Theodora Issa, 2015; Zormanová, 2016).

Open University Characteristic: Allama Iqbal Open University (Pakistan)

The Allama Iqbal Open University was established in 1974. It was the second Open University in the world and the first one in Asia and Africa. The main aim of the University has been providing educational opportunities for masses. It has been a good educational opportunity for people who cannot attend higher education: a new opportunity for millions of people, including women.

In Pakistan the rate of literacy is much lower for women because many conservative parents, especially in rural areas, do not allow their daughters to go out to school. Distance learning has provided educational opportunities also for these girls and women so that the majority of enrolled people are women. The University is keeping the costs at the minimum and has created the Students Assistance Fund, so that the University is open also for lower middle classes and poorer classes. The university has four faculties: Faculty of Arabic and Islamic Studies, Faculty of Education, Faculty of Sciences, and Faculty of Social Sciences and Humanities, 9 regional campuses, and 33 regional centres ("Allama Iqbal Open University").

Dual Mode Model

In this model of higher education, distance education is integrated into the structure of traditional universities. Institutions providing this model of distance education teach both full-time students on campus and part-time students at a distance. Both types of students have the same curriculum and the same admission requirements, take the same exams and the same study materials (Ganor, Gil'ad, Guri-Rosenblit, Ovsyannikov, Shelley, & Zaparovanny, 2000).

Table 2.
Universities with a dual mode model

Name of university	Country
Aston University	The United Kingdom
Boston University	The USA
Ca' Foscari University of Venice	Italy
California State University, Fresno (Fresno's Open University)	The USA
Columbia University	The USA
Dublin City University	Ireland

Georgetown University	The USA
Higher School of Economics	Russia
National Chengchi University	China
Riga Stradiņš University (RSU Open University)	Latvia
San José State University (Open University in San José State University)	The USA
San Francisco State University (Open University in San Francisco State University)	The USA
University of Chicago	The USA
University of Michigan Law School	The USA
University of Navarra	Spain
University of Pennsylvania	The USA
University of San Andrés	Argentina
University of Paris	France
University of Texas at Austin	The USA
Washington University in St. Louis Engineering	The USA

S o u r c e: Own work.

University Characteristic: Dublin City University and OSCAIL (Ireland)

In Ireland, what is characteristic for a dual mode model of distance education is the cooperation of universities with other educational institutions which offer distance education, for example with the British Open University.

The Dublin City University was established in 1975 as the National Institute for Higher Education. DCU has been providing distance education for adults all over Ireland and also abroad for more than 35 years. In 1982 in DCU the National Distance Education Centre was located, which has been offering programmes in a traditional form of distance education. In 2004 it changed into OSCAIL–DCU Online Education because it wants to reflect that it offers the programmes with large elements of online support. OSCAIL is supported financially by the government ("Open Education Unit").

DCU offers the following study online programmes: information technology, business, management, sustainable development, humanities, and nursing ("Open Education Unit"). It is also an institution which measures the quality of distance education, focuses on research in innovative distance learning, and encourages its development ("HEA…," 2009; Zlámalová, 2007).

University Characteristic: National Chengchi University (China)

The National Chengchi University (NCCU) was established in 1927. Nowadays it has 9 colleges specialised in Liberal Arts, Law, Commerce, Science, Foreign Languages, Social Sciences, Communication, International Affairs, and Education, 34 departments, and 48 postgraduate institutes, of which 34 offer doctoral programmes. It offers master and doctoral programmes. For distance education, the National Chengchi University created its own mobile learning platform (NCCU–MLP) ("National Chengchi Univeristy").

University Characteristic: Columbia University (USA)

The Columbia University is situated in the city of New York. It was established in 1754 as King's College by royal charter of King George II of England. It is the fifth oldest institution for higher learning in the USA.

It is consists of the following Colleges and Schools: Architecture, Planning & Preservation School; Arts School; Graduate School of Arts & Sciences; Barnard College; Business School; College of Physicians and Surgeons; Columbia College; College of Dental Medicine; Engineering; General Studies College; School of International & Public Affairs; Jewish Theological Seminary; Journalism School; Law School; School of Nursing; School of Professional Studies; School of Public Health; School of Social Work; Teachers College; Union Theological Seminary. The oldest college is Columbia College, which was founded in 1784. Barnard College was the college for women; it was established in 1889 ("Columbia University…").

Columbia University offers various degree online programmes in various disciplines, for example science, social work, engineering, applied sciences ("Columbia University…").

Model of Consortia

The model of consortia is a partnership of two or more institutions for the purpose of improvement to achieve mutually beneficial goals and to enhance services. All partners share distance learning materials. These partners may be universities or university departments, corporations, government agencies, companies, etc. Each institution as a consortium member has its own management structure. We know several types of consortia: multipurpose academic consortia, technology-planning consortia, local business and industry-linked consortia, and research and academic consortia.

Table 3.
Consortia

Name of university	Country
Boym Universities Consortium	Poland
Claremont Colleges	The USA
Consortium of Universities of the Washington Metropolitan Area	The USA
European Consortium of Innovative Universities	European countries
Kajaani University Consortium	Finland
Open Universities Australia	Australia
Pennsylvania Academic Library Consortium	The USA
University System of Georgia	The USA

S o u r c e: Own work.

Consortium Characteristic: UNINETTUNO (Italy)

The International Telematic University UNINETTUNO, which is a private university situated in Rome, was founded as NETTUNO in 1990. As UNINETTUNO it was established in 2005.

Nowadays UNINETTUNO consists of 43 universities and major telecommunications companies and public bodies. Administrative responsibilities are shared between the National Centre, which provides the national coordination, and partner universities, which enrol students and set up study curricula, timetables, and examinations. UNINETTUNO offers undergraduate and postgraduate programmes, and a variety of diplomas in law, communication, engineering, economics, literature, psychology, and architecture ("Universita Telematica Internazionalle Uninettuno").

Consortium Characteristic: Claremont Colleges (the USA)

The Claremont Colleges are a consortium of five undergraduate colleges (Pomona College, Scripps College, Claremont McKenna College, Harvey Mudd College, Pitzer College) and two graduate universities (Claremont Graduate University, Keck Graduate Institute of Applied Life Sciences), which are situated in Claremont in California. The Claremont Colleges were established in 1925.

The consortium offers bachelor, master, and doctoral degrees in the following disciplines: humanities, social sciences, natural sciences, economics, political science, international relations, public policy, finance, engineering, mathematics, computer science, physical and biological science, arts, psychology, educational sciences, religion, management, information system and technology, community and global health, botany, bioscience, and pharmacy ("The Claremont Colleges").

Consortium Characteristic: European Consortium of Innovative Universities

The European Consortium of Innovative Universities is the international consortium of research intensive universities. The members are: Aalborg University, Dublin City University, Hamburg University of Technology, Kaunas University of Technology, Linköping University, Tampere University of Technology, Tecnológico de Monterrey, The University of Nottingham, Universitat Autònoma de Barcelona, University of Aveiro, University of Stavanger, and University of Twente.

The European Consortium of Innovative Universities was established in 1997. It has gained experience in unconventional teaching and learning methods, knowledge exchange (especially in research), and in administrative structures and practices ("ECIU…").

Franchising Model

This model is characteristic of franchising partner institutions. Distance learning courses from one institution are used in these partner institutions and often adapted by them.

As Healey (2013) notes, many British universities franchise degrees to overseas providers: "Transnational education has become a big business for UK universities. […] Many UK universities license a third party – usually a private, for-profit company – to deliver their degrees through a foreign college." Transnational education has been very popular since 1992 (Healey, 2013).

Table 4.
Franchise universities and schools

Name of university	Country
BMC International College Pte	Singapore
Dimensions International College Pte	Singapore
Intercollege	Cyprus
INTI International University & Colleges	Malaysia
Open University Business School	European countries
Parkway College	Singapore
SRI College	Malaysia
University of Arts and Humanities of Bamako	Mali
University of Nicosia	Cyprus
University of Dar es Salaam	Tanzania
Vancouver Island University	Canada

S o u r c e: Own work.

Franchise University Characteristic: Open University Business School

The Open University Business School has worked with countries in Central and Eastern Europe since 1989. It is very popular in Germany and Austria, and also in the Czech Republic. The first school was founded in Hungary in 1989. The OU Business School has a global reputation. Students from more than 120 countries study there. It offers business and management education. It is also the largest European education institution that confers an MBA degree ("The Open University Business School").

Franchise University Characteristic: SRI College in Malaysia

SRI College was founded in 2004. It focuses on Early Childhood Studies, English Language Studies, and Management Studies. It offers bachelor degrees in Education Studies and Early Years, Business Administration, Accounting, Finance, International Business, and Marketing. SRI College franchise partner is the University of Hertfordshire, which offers Bachelor of Arts in Education Studies ("SRI College").

Conclusion

Local circumstances cause the dominance of a particular model of distance learning in a certain area. The single mode model was dominant in Europe and the USA in 1970s and nowadays is very popular in Asia – especially in India – and in Africa. The single mode model provides educational opportunities for masses, including people who cannot attend higher education, for instance women in Arabic countries.

The dual mode model is very popular in Australia and Canada. The majority of universities in Canada are dual mode model institutions. The dual mode model is also used in the USA. For example, one of Ivy League Universities – Columbia University – realises the dual mode model.

In the USA, Canada, and Australia the model of consortia is also popular. The model of consortia has been popular in Canada and USA since 1960s, and in Australia since 1990s. In 1960s and 1970s, a consortium consisted of colleges and universities which signed an agreement to cooperate in providing some services, such as faculty exchanges, purchase of goods and services, etc. Contemporary consortia are usually structured as multipurpose academic consortia (e.g., the Claremont Colleges in California), research and academic library consortia (e.g., GALLILEO in Georgia, PALCI in Pennsylvania), or business-university alliances (e.g., UNINETTUNO in Italy).

The franchising model is most common in Asia and in Africa. Many British and American universities franchise degrees to African and Asian universities.

Many countries, especially the USA, provide a model of diversity, so that there is no one dominant model of distance education, but there are also dual mode and consortium models.

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Lucie Zormanová

Modele kształcenia na odległość w szkolnictwie wyższym

S t r e s z c z e n i e

Niniejszy artykuł skupia się na zagadnieniach związanych z kształceniem na odległość w szkolnictwie wyższym. Analizuje on i porównuje rozwój kształcenia na odległość i jego warunki w różnych krajach oraz opisuje istotne różnice napotkane w poszczególnych krajach.

Można dostrzec różne formy implementacji kształcenia na odległość. Rozbieżności w podejściu do tej formy kształcenia spowodowane są aspektami kulturowymi, tradycją nauczania na odległość, rozwojem technologii informacyjno-komunikacyjnych oraz normami prawnymi dotyczącymi edukacji.

Istnieje wiele modeli organizacyjnych dla kształcenia na odległość. Pewien model może dominować w jednym kraju, a w innym może występować wiele różnych modeli.

S ł o w a   k l u c z o w e: uniwersytet otwarty, kształcenie na odległość, system elektroniczny, uczenie się przez całe życie, modele organizacyjne dla kształcenia na odległość

Lucie Zormanová

Модели дистанционного обучения в высшем образовании

Аннотация

Статья посвящена дистанционному обучению в высшем образовании. Анализируется и сравнивается развитие дистанционного обучения и условия дистанционного обучения в разных странах. Описываются значительные различия в развитии дистанционного образования в высшем образовании в отдельных странах.

Мы встречаемся с различными формами осуществления дистанционного обучения. Появление дивергенции дистанционного обучения в разных странах обусловлено различными культурными аспектами, традицией дистанционного обучения, развитием информационно-коммуникационных технологий и различными законодательными нормами в области образования.

Существует много типов различных организационных моделей дистанционного обучения. В одной стране может доминировать конкретная модель, а в другой стране может быть множество различных организационных моделей дистанционного обучения.

К л ю ч е в ы е с л о в а: открытый университет, дистанционное обучение, электронная система, обучение в течении всей жизни, организационные модели дистанционного обучения

Lucie Zormanová

Modelos de aprendizaje a distancia en educación superior

Resumen

Este artículo se centra en el aprendizaje a distancia en la educación superior. Analiza y compara el desarrollo del aprendizaje a distancia y las condiciones del aprendizaje a distancia en diferentes países. Describe diferencias significativas en el desarrollo de la educación a distancia en la educación superior en los distintos países individualmente.

Nos encontramos con diversas formas de aplicación de la educación a distancia. La aparición divergente de la educación a distancia en diferentes países proviene de diferentes aspectos culturales, de la tradición del aprendizaje a distancia, del desarrollo de la tecnología de la información y la comunicación, y de las diferentes normas legislativas en el área de educación.

Existen muchos tipos de diferentes modelos de organización para la educación a distancia. Un modelo particular puede que sea dominante en un país, mientras que en otro país puede contener una variedad de diferentes modelos organizativos de la educación a distancia.

P a l a b r a s c l a v e: universidad abierta, educación a distancia, sistema electrónico, aprendizaje permanente, modelos organizativos de la educación a distancia

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Blended Learning Model for Computer Techniques for Students of Architecture

Abstract

The article summarises two-year experience of implementing a hybrid formula for teaching computer techniques at the Faculty of Architecture at the Gdańsk University of Technology. Original educational e-materials – consisting of video clips, text and graphic instructions, as well as links to online resources – are embedded in the university e-learning educational platform. The author discusses not only technical constraints associated with the creation of e-materials and their deposition on the Moodle platform, but also associated didactic challenges, such as the evaluation of students' skills and real time communication.

K e y w o r d s: blended learning, multimedia instructions, computer graphics software

Introduction

Contemporary digital technologies have opened many possibilities for learning in the distributed environment. Created as a combination of traditional learning systems and distributed learning systems, blended learning has been identified as one of the strongest trends in higher education for a decade. At the same time, the benefits and challenges of various hybrid formulas have been closely observed by didactics theorists and practitioners for many years. A compendium manual entitled *Handbook of blended learning: Global perspectives, local designs* highlights and

provides targeted information on specific blended learning situations (Bonk & Graham, 2006). Nevertheless, transforming a qualitative existing university course into a hybrid formula, which takes advantage of the strengths of each environment and avoids its weaknesses, is a huge challenge. The issues specific to teaching material, functionality of an education platform, faculty students' preferences, and the teacher's work style must be carefully mediated and taken into account. According to Graham, "like any design problem this challenge is highly context-dependent with a practically infinite number of possible solutions" (Graham, 2006, p. 16).

The article provides the analysis of methodological and technical aspects of the academic subject called "computer techniques," successfully realised in the blended learning formula by means of the university educational platform. The subject is taught at the first year of study at the Faculty of Architecture at the Gdańsk University of Technology.

Didactic literature has identified various reasons behind the teacher's choice to design or use a blended learning system in their practice (Bonk & Graham, 2006, pp. 3–21). In the case of the discussed model for computer techniques, blended learning was chosen mainly for three reasons: improved pedagogy, increased access/ flexibility and easy revision availability. The hybrid formula was implemented in the 2016/2017 academic year and was completed by approximately 220 Polish and foreign students during a total of four consecutive terms. The original didactic e-materials, especially designed for the course participants, are also described in the paper, along with the results of the course evaluation.

The General Concept of the Model

The educational praxis seems to involve a great variety of blended learning formulas, implemented at different organisational levels. Peercy and Cramer claim that "successful hybrid teaching cannot be a mish-mash of traditional lecturing with some online content but rather a thoughtful re-design of course pedagogy, and meaningful interactions with students" (2011, p. 628). The discussed concept is designed on the basis of the author's personal long didactic experience in teaching computer techniques, as well as innovative educators and organisations in this arena, the principles of general methodology, and the methodology of teaching computer programmes. The changes applied neither to the objectives of the course, nor to the number of class hours or the placement of the subject in the curriculum. The author's hybrid model combines person-to-person interaction, self-paced learning, and learning-materials interactions that overlap in time as a part of the course. The online activities are not obligatory, thus the proportions of time spent

online versus in-class are not defined (the amount of laboratory time is not reduced compared to the traditional course). Since the lab classes already consisted of active learning exercises, minor changes were introduced for this part of the course.

Specificity of Teaching Content

There are two main purposes of education within the subject of computer techniques at the Faculty of Architecture. Firstly, the students are expected to gain the knowledge of computer application types used in architectural design and the latest trends in digital design. Secondly, they should master practical digital tool skills. Thus, as a rule, classes (15 students per group) are conducted in a computer lab equipped with high-end hardware and Internet access. The choice of the software has been dictated by widespread use in Polish architectural offices and ease of availability for students. AutoCAD and Revit are guaranteed free access for students, whereas SketchUp is an open source application, and Corel Draw Graphics Suite educational edition is relatively inexpensive.

The thematic scope in the first term of study (30 lab hours) covers: 2D vector drawing and 3D modelling skills, and post-processing of raster images, followed by the overview of the usage of digital and communication technology in architectural practice. The scope of teaching in the second term is focused on architectural visualisation skills, necessary for communicating design ideas to co-designers, industry, and potential customers. Teaching content also includes general information related to computer graphics itself, as well as a discussion on current trends in digital design (e.g., introduction to building information modelling) (see Appendix 1: Teaching content).

The limited number of teaching hours prompted the author to transform the course formula into blended learning in order to effectively teach content material to students with varied abilities and preferences. The Faculty of Architecture at the Gdańsk University of Technology is highly feminised. Approximately 80% of the 180 students enrolled in the department each year are female. Many women are reserved towards computerised classes, which can only be explained by stereotypes in their perception of self-efficacy and learned ineffectuality (this observation of the author seems to follow gender studies conclusions). Blended learning, with the possibility to learn at one's own pace, at the time and place one chooses, serves to reduce student stress during lab activities and helps in home assignments (Hibbert, 2014; Peercy & Cramer, 2011).

Didactic Principles

The selection of teaching methods, means, and organisation of the discussed blended learning formula is based on the following learning principles (Marius-Costel, 2010, pp. 26–32):
- *The principle of the conscious and active participation of students in the education process*. According to this principle, students participate effectively

in the didactic activity by drawing, modelling, or accomplishing graphical assignments during laboratory classes.

- *The principle of thorough acquisition of knowledge, skills, and abilities*. The difficulty of drawing tasks increases as students explore new options and build up their prior knowledge, for example, only after students gain knowledge of general construction, are they introduced to BIM software.
- *The principle of accessibility and individuality*. During laboratory activities participants listen to explanations and follow the image from a projector connected to a teacher's computer. Online content allows students to practise drawing/modelling exercises repeatedly at a convenient time.
- *The principle of connecting theory with practice*. This means that new programme features are introduced in the context of drawing tasks. The teaching material (the exercises) is implemented regarding topics closely related to architectural practice such as: virtual architectural models, architectural visualisation, architectural documentation, document publishing.
- *The principle of systematisation and continuity*. This principle is expressed by pointing out the analogy between the principles of descriptive geometry methods and the nature of a drawing/model generated in virtual space. Geometric terminology, such as orthogonal projection, contour line, perspective view, angle of view, isometry, etc., is in use here.
- *The principle of intuition*. This principle is emphasised through a series of examples leading to the same effects by the usage of different tools and drawing strategies, for example, creating a surface vs a solid model vs a mesh model.
- *The principle of reverse connection*. Feedback is provided twice. To begin with, computer software by nature provides a user with instant feedback – an executed command or an error message. Secondly, samples of accomplished tasks are published in an online course gallery, and students receive comments on their works (grades and grading rules are also provided online).

E-learning Materials

Information technology makes it possible to create complex and rich forms of multimedia instruction and communication. This requires a proper redesigning of traditional instructions or designing new e-materials from scratch. As Joanna Opoka points out, "Endless pages filled with text, diversified to a greater or lesser extent by graphics, are the transfer of media characteristic of another epoch of the printing age. And so, the 'multimedia lecture' is defined as a lecture recorded with a digital camera for students attending a meeting with a teacher" (Opoka, 2008, p. 126). As mentioned before, the discussed hybrid formula is based on the e-learning

university platform. The original teaching materials consist of video films, text and graphic instructions (displayed on the website or provided as downloadable materials in jpg, pdf, or exe formats), and direct links to online resources.

Technical and Methodological Issues

Video recordings play an important role in the author's concept of the blended formula. They provide teaching material in a more complete and efficient way than text-to-picture instructions would (Hibbert, 2014; Lamport & Hill, 2012). In fact, it is the continuous recording of screen activities that allows users to track the workflow of digital drawing/modelling. CamStudio, an open-source software that allows for recording video sequences from a computer screen and microphone sound, has been used for that purpose. CamStudio records all operations performed by the user – mouse movements, application launch, text input, etc.[1] The videos are split into relatively short, manageable parts, typically illustrating one problem (please refer to an exemplary video: https://youtu.be/tC4LIkwgIuk). The Moodle platform uses YouTube for managing video files. Due to the imposed file size limitation, course videos have text annotations (e.g., commenting on keyboard shortcuts), but no soundtrack. YouTube editor made it possible to remove frames with saved software errors or misuses. In total, there are more than 50 online videos displayed along with the content of the course lessons.

In addition, text and screenshots are used for explaining and illustrating a step-by-step execution of various commands (alike programme manuals). CAD software and graphics programmes, which are the basic teaching content of the course, are under constant development. A new version of AutoCAD programme, containing more advanced functions and interface lift, is released every year. During lab classes, the students use the AutoCAD 2016 version. However, they are often offered by AutoDesk to use the latest versions (now AutoCAD 2018) on their private computers. This discrepancy in software versions causes practical problems and necessitates a duplication of instructions.

Website Layout

The layout of the online content corresponds to the educational logic of the course schedule and is based on the platform functionality. The course site design is meant to provide a clear picture for the students of what is taught and should be learned during the course. A weekly format has been chosen for every term, resulting in 15 distinct parts for "computer techniques I" (one section for each week of the term) and 8 distinct parts for "computer techniques II" (the classes were held for 8 weeks). Each section consists of three or four parts, depending on the teaching context:

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[1] In addition, CamStudio allows a user to convert standard avi files to a Flash animation (swf).

- the main teaching material covering theoretical and practical information provided as text, images, videos, instructional animations, links to other resources, for example, websites of architectural offices, architectural journal articles;
- the teaching aids for downloading, for example, building plans, textures for renderings, file templates, etc.;
- the content contributing to the main teaching material (e.g., dealing with more complex models or advanced, sophisticated tools), which is marked as for "enthusiasts"; and
- the link to upload assignments (e.g., checking exercise, homework).

In addition, the site includes private storage space for incomplete works which are not subject to verification, along with galleries of visualisations and other graphics tasks done by the students. The gallery is a motivating factor, as well as an element of a peer-to-peer learning strategy.

The whole content for each subject has been available from the beginning of the term. It created a context where the students were able to plan and work ahead, for example, to adjust their viewing schedules in response to the overall demands that were being placed on them. In the case of ERASMUS, the advantages go as far as choosing the topics they needed (foreign students usually followed different curricula at their master universities).

Hybrid Course Functioning

The specificity of computer techniques requires laboratory classes which are meant to be synchronous. Guided by the teacher, the students familiarise themselves with the workflow appropriate for various tasks, such as drawing, modelling, and post-processing in various applications. Software commands are introduced and discussed on the occasion in the context in which they appear in the creation process. During a lab live instruction, the image from the instructor's monitor is displayed by a projector on the wall screen. The students receive prints of floor plans, sections and elevations, along with dimensions, if needed. For visualisation purposes, the pre-prepared models of object geometry are sometimes provided. The workflow is at first only tracked by the students; then the task is performed along with the teacher at an imposed pace adapted to the complexity of the task (if necessary, the students receive individual support). At the end of the class, files are being uploaded to individual accounts on the platform for archiving and final evaluation. In principle, laborious obligatory tasks may be completed or corrected at home. Online teaching and learning content and tasks (which occurred as asynchronous) are made available for registered participants, but not required.

On the one hand, the existence of the online module takes off the time pressure from the teacher; on the other hand, it reduces the stress level during the lab class. These two advantages of the hybrid course design are repeatedly mentioned in the literature explaining the hybrid learning approaches (Karabulut & Jahren, 2016; Lamport & Hill, 2012; Peercy & Cramer, 2011).

Communication Issues

The Moodle platform adopted by the Gdańsk University of Technology does not allow teacher–students or student–student interactions in real time. Nevertheless, with additional communication via the platform, it has been possible to improve methodology, and to update and enrich the content to meet actual expectations and needs of the users. Looking from a teacher's perspective, an important advantage of the online part of the course has been the ability to rapidly distribute uniform or customised learning materials, attach grades and comments to students' homework, update a rating journal and schedules automatically, etc. From students' perspective, personalised feedback, such as notes on how to solve tool problems, practical and troubleshooting tips (provided with huge commitment from the teacher), have been an extra advantage compared to the traditional formula. For a practical reason (one teacher and 110 students enrolled on the hybrid course each term), there was no agreement between the students and the teacher regarding the time to answer e-mailed questions, which sometimes resulted in delayed communication. Because the Moodle platform does not provide communication close to the same levels of fidelity as in the face-to-face environment, the teacher's educational experience played an important role in verifying the credibility of home assignments authorship. Figure 1 shows students' renderings at different difficulty levels: basic and advanced options.
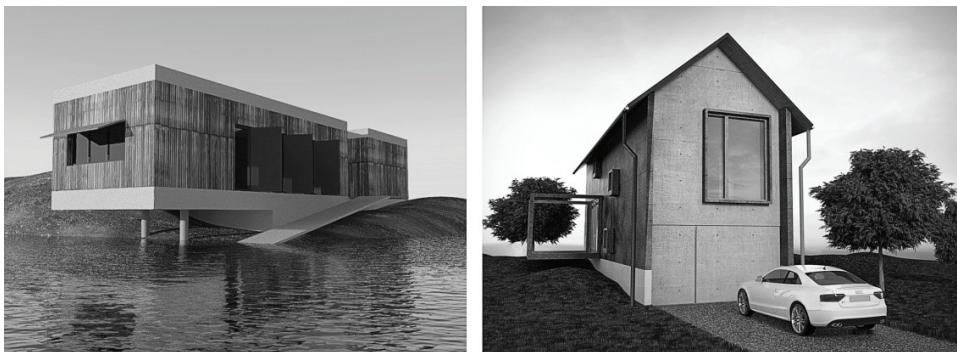

Figure 1. Left: basic rendering with Sunlight and Sky illumination only (Barbara Gwóźdź). Right: advanced rendering in V-Ray with HDRI Sky (Piotr Grabowski).

Course Evaluation

The analysis and evaluation of the discussed hybrid computer techniques course brought several findings corresponding to specific contexts and real life constraints. The evaluation of the blended learning formula for computer techniques was based on the analysis of quantitative data (such as students' grades and their website activity) and qualitative data (such as students' satisfaction, achievement of additional educational aims, and smoothness of the didactic process).

Evaluation Results

The summative evaluations discussed in this paper were collected in February 2017 (computer techniques I) and June 2017 (computer techniques II). Final assessments for each term included in-class exercises, home assignments, and practical skill tests (besides, some non-obligatory tasks were suggested). In the first term, the students had to complete four obligatory assignments and three practical skill tests (the maximum score for each task was 100 points, the minimum passing score was 60 points). The students' score results showed, to a great extent, that the level of their achievements was very satisfactory. The arithmetic average for total test results conducted during computer techniques I was 77 points. The average score obtained by the students for one of the home assignments (a house visualisation) was 92 points. Post-processing of the visualisation using Photo-Paint was not obligatory; nevertheless, 78% of the students performed the task, and the average was 72 points. The summative evaluation of computer techniques I achievements showed that as much as 26% of the students received at least 91% of the requirements and only 5% reached the lowest scores range between 60 and 70 points (nobody failed).

In the second term, the students had to complete four obligatory assignments and one practical skill test (as before, the maximum score for each task was 100 points, the minimum passing score was 60 points). The final practical skill test was carried out at the end of the term, and the arithmetic average of it was 86 points. The summative evaluation of computer techniques II achievements showed that as much as 40% of the students received at least 91% of the requirements, and only 10% reached the lowest scores range between 60 and 70 points. Moreover, thanks to the education platform, the students managed to keep a deadline more often and submitted the projects on schedule during the term. Consequently, only 4% of the students failed to submit the work for evaluation at the end of June, and thus completed the course and received a final grade as required by faculty regulations. Compared to previous traditional courses conducted by the author, the number of failures decreased by 4 times.[2]

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  [2] Students who do not finish on time may still pass the course in the make-up exam session.

In the author's opinion, the achievement of educational aims was strongly confirmed by the students' behaviour indicating high motivation for learning, meaning that they generally were willing to improve their works even though they had already achieved 60 points. For example in the case of a digital model of chess figures (second term), only 14% of the students did not take advantage of the possibility to improve their work and stayed satisfied with the initial evaluation. Quite a lot of participants completed the complex non-obligatory tasks. The model of a round house (based on the design realised by Robert Konieczny) can serve as an example for the first term – 36 files were uploaded for evaluation (the video illustrating the modelling technique in SketchUp was viewed 131 times, and plans were downloaded by 69 students). During the second term, the challenging advanced night scene with artificial lights was likewise chosen by 35% of the users, although the day scene would be enough to receive a high grade (the video illustrating strategies for a night scene rendering in AutoCAD was viewed 101 times).

The online activities were not considered as a part of the students' grade but rather as an indicator of the students' satisfaction in the hybrid formula. The conclusions were drawn from the data such as viewing patterns or online attendance record provided by the Moodle platform. These tools have been available and used in the educational practice relatively recently (Hugo & Brennan, 2016). To evaluate the course, overall schedule viewing statistics can be derived from the online watch data. Figure 2 shows that the culmination of student activities concentrates around visualisation skills and indicates that students rarely watch content consistently on a week-to-week basis, yet rather adjust to the amount of work.

In turn, entry data show that not all students know how to take advantage of both ends of the spectrum (students often placed a greater value or emphasis on the face-to-face aspects of the educational experience).
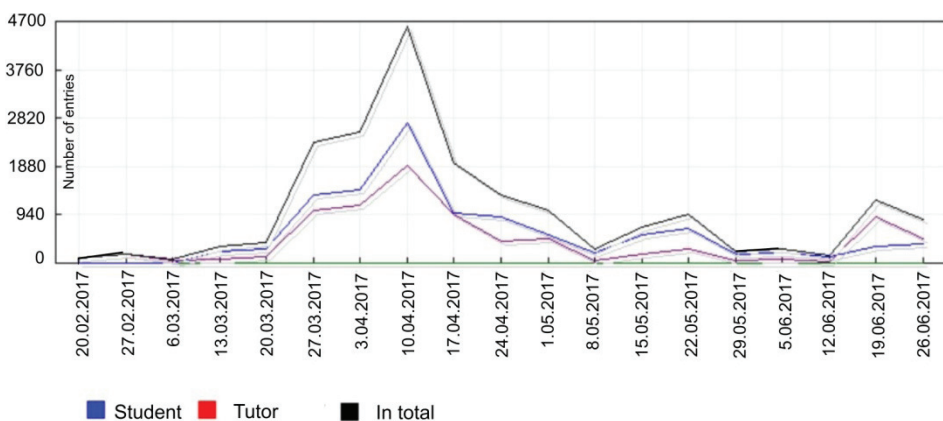

Figure 2. Computer techniques II entry statistics: students, tutor, in total.

S o u r c e: Own work on the Moodle platform.

With the online content delivered through YouTube, it was also possible to use the analytic package within YouTube. Videos had view numbers that in some cases were higher than the number of students, suggesting that some students watched the videos several times (see Appendix 2: Number of views).

Resources on the platform are still used by registered users (several months after the end of the term). In the faculty survey conducted after the end of the academic year, the course formula was evaluated by the students at the arithmetic average 4.9 (out of 5). To sum up, at the cost of increased demand on the instructor's time, the implemented hybrid formula has provided advantage over other teaching techniques for the participants in this study.

Conclusion

Higher educational institutions in Poland have recently called for a widespread implementation of technological innovations to respond to rapidly changing demands of the 21st century. The advantage of learning in the distributed environment is that this model provides opportunities for incremental changes to the methodology but does not radically change the way teaching and learning occur. In the discussed hybrid formula for computer techniques I and II, the teaching and learning of fundamental objectives are realised by traditional training (tutoring in a teacher-led laboratory). The goal behind implementing online content was to effectively teach content material to students with varied abilities and preferences, providing them with the material to deepen and broaden the range of acquired knowledge and skills, as well as to assist them in repetition and consolidation. This enabled learner-centred strategies, which in the school life reality are significantly hampered by time constraints. Online activities seem to indicate that many students succeeded in grasping that learning is an active process of constructing knowledge, rather than simply acquiring it. Computer graphics enthusiasts and those who show interest in developing skills beyond the content curriculum have gained motivation and support. Blended learning environments supported increasing learner maturity and capabilities for self-regulation. At the same time, it proved that some students at the beginning of the course were not prepared to use the educational platform in order to support their learning effectively and creatively. However, regardless of proportions of time spent online versus in-class, the vast majority of the students benefitted from mixed environment.

The success of hybrid courses depends on the perception of students and the faculty towards this design. There is no doubt that in the educational process student results should be the top priority (presumably followed by cost savings on the part of the educational institution). The degree of student learning satisfaction

plays an important role in evaluating the effectiveness of the hybrid learning environment. This also implies that the hybrid course was worth the time and effort of the teacher. Next year, more effort will be taken to activate the user forum on the platform to provide additional educational space.

In the author's opinion, teaching and learning in a traditional formula, blending options, or fully online courses should be "equivalent" experiences to be selected basing on learner preferences. Graham believes that "it may even become so ubiquitous we will eventually drop the word 'blended' and just call it learning" (Graham, 2006, p. 7).

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Appendix 1. Teaching content

Computer techniques I (30 lab hours)
1. Introduction to 3D modelling in SketchUp – 2 h
2. Building models of architectural objects – 2 h
3. Introduction to architectural visualisation – 2 h
4. Curvilinear surface modelling – 2 h
5. Modelling skill test I – 2 h
6. Introduction to AutoCAD – 2 h
7. Advanced drawing tools and drawing aids cont. – 2 h
8. Rules for digital engineering documentation drawing – 2 h
9. Drawing conceptual floor plan in AutoCAD – 2 h
10. Drawing skill test II – 2 h
11. Introduction to post-processing in Corel Draw Photo-Paint – 2 h
12. Post-processing special effects cont. – 2 h
13. Digital collage (abstract self-portrait) – 2 h
14. Vector drawing and text editing in Corel Draw – 2 h
15. 2D graphics skill test III – 2 h

Computer techniques II (15 lab hours)
1. Introduction to 3D modelling in AutoCAD – 2 h
2. Solids and surfaces modelling in AutoCAD – 2 h
3. NURBS modelling in AutoCAD – 2 h
4. Cottage model based on elevations and floor plans – 2 h
5. Introduction to rendering in AutoCAD – 2 h
6. Creating a visualisation of an architectural object in AutoCAD – 2 h
7. Modelling and visualisation skill test – 2 h
8. Introduction to BIM concept (Revit) – 1 h + non-obligatory 1 h

Appendix 2. Number of views for five top videos used for computer techniques I and computer techniques II

Computer techniques I – 107 students enrolled on the hybrid course; the analysed period: 1 September 2016–27 January 2017

No.	Video title/content	Views
1	Building a cottage model in SketchUp	367
2	Modelling a house from floor plans in SketchUp	221
3	Creating materials in SketchUp	209
4	Adjusting scene content in SketchUp	240
5	Usage of 2D window blocks in AutoCAD	174

Computer techniques II – 110 students enrolled on the hybrid course; the analysed period 23 February 2017–20 June 2017

No.	Video title/content	Views
1	Nurbs modelling – a chapel model in AutoCAD, part 1	288
2	Solid modelling in AutoCAD – a chess figure	243
3	Mesh modelling in AutoCAD – a chess figure	241
4	Nurbs modelling – a chapel model in AutoCAD, part 2	212
5	Matching raster image size to programme units	214

Maria Helenowska-Peschke

Model *blended learning* dla przedmiotu techniki komputerowe dla studentów architektury

S t r e s z c z e n i e

Niniejszy artykuł podsumowuje dwuletnie doświadczenie wynikające z wprowadzenia formuły hybrydowej dla nauczania przedmiotu techniki komputerowe na Wydziale Architektury Politechniki Gdańskiej. Autorskie materiały edukacyjne składające się z wideoklipów, instrukcji tekstowych i graficznych oraz linków do zasobów online zostały umieszczone na uczelnianej platformie e-learningowej. W artykule zostały omówione ograniczenia technologiczne związane z tworzeniem e-materiałów i udostępnieniem ich na platformie Moodle, a także wyzwania dydaktyczne, takie jak ocena umiejętności studentów i komunikacja w czasie rzeczywistym.

S ł o w a   k l u c z o w e: *blended learning*, instrukcje multimedialne, programy graficzne

Maria Helenowska-Peschke

Смешанная модель обучения компьютерным техникам для студентов- архитектуров

А н н о т а ц и я

В статье кратко излагается двухлетний опыт внедрения гибридной формы для обучения компьютерным техникам на архитектурном факультете Гданьского технологического университета. Оригинальные образовательные электронные материалы, состоящие из видеороликов, текстовых и графических инструкций, а также ссылки на онлайн-ресурсы, встроены в образовательную платформу электронного обучения в университете. Автор обсуждает технические ограничения, связанные с созданием электронных материалов и их размещением на платформе Moodle, а также связанные с ними дидактические задачи, т.е. оценка навыков учащихся и общение в режиме реального времени.

К л ю ч е в ы е   с л о в а: смешанное обучение, мультимедийные инструкции, программное обеспечение для компьютерной графики

Maria Helenowska-Peschke

Modelo de aprendizaje mixto para técnicas informáticas para estudiantes de arquitectura

R e s u m e n

El artículo resume la experiencia de dos años de implementación de la fórmula híbrida para la enseñanza de Técnicas de Computación en la Facultad de Arquitectura de la Universidad de Tecnología de Gdansk. Los materiales educativos originales consisten en videoclips, instrucciones de texto y de gráficos, así como enlaces a recursos en línea los cuales están integrados en la plataforma educativa universitaria de e-learning. El autor debate acerca de las limitaciones técnicas asociadas con la creación de materiales digitales y su subida a la plataforma Moodle, así como los desafíos didácticos asociados a la evaluación de las habilidades de los estudiantes y la comunicación en tiempo real.

P a l a b r a s   c l a v e: blended learning, instrucciones multimedia, software de gráficos de ordenador

Andrii Kostiuchenko
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Features of Implementation
of a Learning Management System
in the Educational Process in a Ukrainian University

Abstract

The issue of regulation of a learning management system (LMS) at the state level of Ukraine is considered in the article. Types and interpretations of electronic educational resources that can be used in distance education are pointed out. The Moodle environment, as an example of one of successful learning management systems, is considered. In particular, the article contains a list of roles that can be shared by users of a learning management system. The general structure of an e-learning course, which can be used by educational institutions, is also proposed.

K e y w o r d s: distance education, electronic training course, electronic educational resource, learning management system, Moodle

Introduction

At present, computer technology and the Internet are developing rapidly, and new ways of learning are developing along with them. Due to the development of the Internet and modern methods of communication and data exchange, e-learning is gaining increasing popularity. It becomes possible to create and apply more qualitatively electronic notes, encyclopaedias, tests, glossaries, questionnaires, virtual laboratories, etc. Elements of e-learning are widely used in distance

learning. Currently, there exists a large number of learning management systems (LMS), including aTutor, Efront, ILIAS, Moodle, and Sakai. Such LMS can be used both for full-time distance learning and for partial tuition of full-time or part-time students.

Regulation of a Learning Management System at the State Level of Ukraine

Electronic Educational Resource as an Element of E-learning

At the state level of Ukraine, there is a slightly different term that includes elements of distance learning, namely, an electronic educational resource (EER). According to the order of the Ministry of Education and Science, Youth, and Sports of Ukraine No. 1060 dated 1 October 2012, with changes in accordance with the order of the Ministry of Education and Science No. 1061 dated 1 September 2016, "Regulations on electronic educational resources," electronic educational resources are educational, scientific, informational, reference materials and tools developed electronically and presented on any type of media or placed on computer networks, which are reproduced using electronic digital techniques and are necessary for the effective organisation of teaching and educational process in the part concerned with qualitative educational and methodological content ("On Approval of the Regulation on Electronic Educational Resources…," 2012).

Thus, an EER is an integral part of the teaching and educational process, has a teaching and methodological purpose, is used to provide educational activities for pupils and students, and is considered to be one of the main elements of the informational and educational environment. The purpose of an EER is to modernise education and content of the educational space, and to provide equal access for participants of educational process – regardless of their place of residence and forms of training – to qualitative educational and methodological materials, created on the basis of information and communication technologies.

Types of Electronic Educational Resources

The main types of EER are ("On Approval of the Regulation on Electronic Educational Resources…," 2012):
- electronic document – a document in which the information is represented in the form of electronic data;
- electronic publication – an electronic document that has been edited and published;

- electronic didactic demonstration materials – electronic materials (presentations, schemes, video and audio recordings, etc.) intended to accompany the educational process;
- information system – an organisationally ordered set of documents and information technologies, particularly with the use of technical means that implement information processes and are intended for storage, processing, search, distribution, transmission, and provision of information;
- computer test – standardised tasks, represented in an electronic form, intended for entrance, intermediate, and final control of educational achievements, as well as self-control; processing of results is carried out with the help of appropriate programmes;
- electronic dictionary – an electronic reference edition in the form of an ordered list of linguistic units (words, phrases, terms, names, signs) supplemented by relevant reference data;
- electronic directory (guide) – an electronic reference publication of an applied type;
- electronic tutorial – an educational electronic edition, whose usage complements or partly replaces the textbook;
- electronic textbook – an electronic educational publication with systematised presentation of teaching material that corresponds to the educational programme, contains digital objects of different formats, and provides interactive cooperation (або interaction);
- electronic instructional materials – an electronic educational edition of explanations on a certain topic, section, or issue of a discipline with a presentation of the methodology of execution of individual tasks, a particular type of work;
- distance learning course (e-learning course) – an information system that is sufficient for training in individual academic disciplines by indirect interaction of distance learning participants; and
- electronic laboratory workshop – an information system that is an interactive demonstration model of natural and artificial objects, processes and their properties with the use of computer visualisation tools.

LMS Moodle

The Main Features of LMS Moodle

Moodle (Modular Object-oriented Dynamic Learning Environment) can be attributed to the course management system (CMS), the learning management system (LMS), or the virtual learning environment (VLE). Moodle focuses primarily on the organisation of interaction between a teacher and students, and can

be used both for the organisation of traditional distance courses and for the support of full-time or part-time studies. The Moodle software platform is a free and open source software, that is, distributed free of charge and as an open source. The Moodle system is widely used in many universities of the world and has a large number of localisations, including Ukrainian ones ("Moodle…").

Moodle is a toolkit for developing both individual online courses and educational Web resources. The use of LMS Moodle provides a number of opportunities: to place interactive teaching materials in the network; to organise students' independent work; to differentiate access to educational materials; to provide control over the process of studying the material and execution of tasks; to automatise the evaluation procedure; to organise the distance interaction of the participants of the educational process; to manage the student portfolio; and to preserve the history of learning (Franchuk, 2011, p. 4; Kostiuchenko, 2016, pp. 5–6; Smyrnova-Trybulska, 2007, pp. 46–47, 163–165).

The teacher at his or her own discretion can use both thematic and calendar structuring of the course. A thematically structured course is divided into sections by subject. In calendar structuring, the study of the course is given as a separate section each week; such structuring is convenient for distance learning organisation and allows students to correctly plan their educational work.

LMS settings allow the user to change the appearance and structure of the distance learning course at any time, which makes it easy to update the content of disciplines. Editing the content of the course is conducted by the course author in an arbitrary order and can be easily implemented directly in the learning process. It is very easy to add various elements to the electronic course: lecture, task, forum, glossary, wiki, chat, etc. For each e-course there exists a convenient page for viewing the latest changes in the course. Thus, LMS Moodle provides the teacher with a significant toolkit for presenting educational and methodological materials of the course, conducting theoretical and practical classes, and organising educational activities, both individual and group ones.

Since the main form of knowledge control in distance learning is testing, LMS Moodle is a great tool for creating tests and conducting training and control testing. A large number of types of questions are supported in test tasks (multiple choice, matching, true/false, short answers, essay, etc.). Moodle provides many features that make testing easier. The system contains advanced tools for a statistical analysis of test results and, most importantly, the complexity of individual test questions for students.

Most elements of the e-course in LMS Moodle can be evaluated. The teacher can create and use different assessment systems in the course. All ratings are collected in a general log, which contains convenient mechanisms for summarising and creating reports. Moodle provides an opportunity to control the attendance, the activity of students, and the time of their academic work in the network; it provides the efficiency and comfort of the process of independent work.

To provide the compatibility of the training modules of different LMS, there exist special standards for the development of these modules that are supported by LMS Moodle. SCORM (Sharable Content Object Reference Model) provides component compatibility and the possibility of their multiple use regardless by whom, where, and with the help of what means they were created. AICC HACP (HTTP-based AICC / CMI Protocol) is a formalised way of exchanging data between learning material and LMS through direct HTTP links, and it also contains rules for creating metadata and packaging of created learning materials. LTI (Learning Tools Interoperability) is a standardised way to integrate educational applications from the most extensive educational content providers (Pearson, McGraw Hill, and others) with LMS.

The use of learning management systems, including Moodle, always entails certain complexities. This is due to the fact that for such systems quite often there is no uniform appearance and unambiguous translation into Ukrainian or another language. Each specific system is installed, adjusted, and refined in different ways. However, there are advantages as well, because one LMS site is not similar to another (an LMS site can be adapted to the form of the educational institution site).

The Course as the Main Element of an LMS

The course is usually represented as a tree and contains many other structural elements. In a general view, the course consists of sections. The course sections include electronic teaching materials of different designation (see Figure 1). Sections and e-learning materials are sometimes referred to simply as elements of the course.

Course
  General section
    Electronic educational materials of the general section
  Section 1
    Electronic teaching materials of section 1
  Section 2
    Electronic teaching materials of section 2
  Section 3
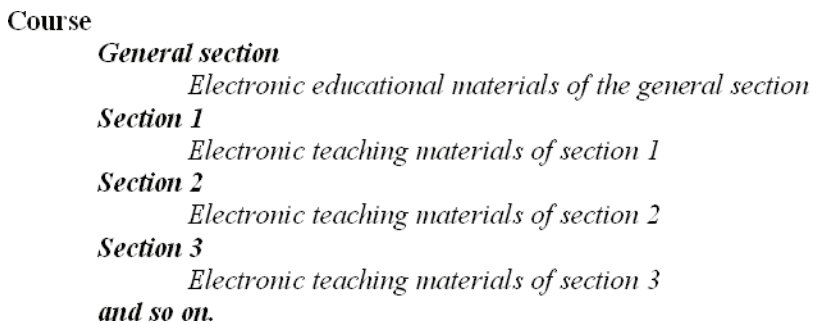   *Electronic teaching materials of section 3*
  and so on.

Figure 1. A general view of the course.

S o u r c e: Own work.

Roles and User Rights in LMS Moodle

Each visitor of the site operating on the Moodle platform has certain rights to certain actions within the system. For example, the person who installed the system has the most rights: the right to remove the system, to change the name of the site,

etc. On the contrary, a user who is not registered on the system, as a rule, has the least rights: to go to the main page and view the materials placed in free access.

A set of user rights is determined by their role. Moreover, the same user can have several roles in different parts of the system (categories, courses, activity, or resource). In LMS Moodle, there is a role hierarchy (ordered by the granting of rights): administrator, manager (training organiser), course author, teacher, assistant, student, guest (Kostiuchenko, 2016, pp. 13–16; "Moodle…"; Tryus, Herasymenko, & Franchuk, 2012, pp. 16–20).

The system administrator has the widest range of rights. In essence, he or she has access to any system action: from user registration to course editing. However, the administrator's duties, as a rule, include system setup: definition of registration rules, definition of the form, methods of evaluation, connection of additional modules, information security, and so on. The system administrator is assigned only globally.

In the first version of LMS Moodle the duties of the training organiser were performed by the administrator. However, with this approach, firstly, the administrator of the training organisation was very loaded, although in essence he or she had to deal with the technical configuration of the system. Secondly, the user who actually had to engage in learning organisation was provided with critical capabilities as to the technical component. Therefore, to unload the administrator and increase the security of the system, a new role has been introduced – the manager.

The responsibility of the manager is to manage the process of distance learning within the whole system or its individual parts (categories, courses). Accordingly, he or she has the right to edit almost any elements of the system, but not its basic settings. It should be noted that the role of the manager can be provided to the user at the level of the whole site or at the level of a certain category, so the list of rights of such managers will be different. The manager at the site level has the right to administer the entire site and all its categories and courses. The manager at the category level is given the rights to manage this category, its subcategories, and courses of this category.

The following three roles in the list of the hierarchy – course author, teacher, assistant – are combined with one goal, which is the development of courses and the management of the learning process during the course.

The course creator is a user with the right to create a new course in the system without the special permission of the administrator. The author of courses is the developer of courses, who can also teach in them, that is, he or she has the teacher's rights.

A teacher editing is the teacher. The responsibilities of the teacher include editing the course and organising the educational process within it. However, the role of the teacher also gives the right to develop courses, providing that the basis for the course is already established in advance by the user who has a higher role in the hierarchy.

A teacher non-editing is a teacher without the right to edit the course (the assistant). The duties of the assistant include the organisation of training in the course or courses: enrolment of students to the course, the distribution of students in groups, analysis and evaluation of students, and communication in forums and chats.

Organisation of the process of distance learning can be successfully managed without assigning someone as the teacher (teacher editing) or the assistant (teacher non-editing). However, in the presence of relevant tasks and human resources in an institution, one can do the way suggested by the developers of Moodle and define the responsibilities more clearly.

The student is the one whom all who stand higher in the role hierarchy work for. The student is a system consumer. However, what can be understood under the word "consumption" in this case is not only contemplation, learning the material, and performing test tasks. The rights of the student are outlined in his or her activities as part of the training course: reviewing elements of the course, participating in surveys, discussions in forums and chats, performing interactive tasks, tests, etc.

The roles of the course author, the teacher, the assistant, and the student can be assigned as part of the system as a whole (global roles), within the category of courses (for example, organisers of training and course authors by profile of a category), one course (as a rule, this way teachers, assistants, and students are appointed) or even within the element of the course (students).

The guest (anonymous user) has a special role. The fact is that the Moodle system is aimed at the initial closure for external (unregistered) users. As long as the user is not authorised, only a small portion of the material is available for him or her as for all users of the Internet. To open additional access to unregistered users in Moodle, there is the anonymous authorisation method (go as the guest), due to which some courses are available to the user without entering a login and password (guest access must be open in the settings of such courses). However, the guest can only view the materials of the course and get acquainted with them. He or she cannot participate in interactive training, since the implementation of course elements is always linked to a specific user registered in the system.

User actions in accordance with the basic role of LMS Moodle in relation to the course can be defined as follows: the administrator – setup, the manager – organisation, the author of the course – development, the teacher – editing and teaching, the assistant – teaching, the student – studying materials and tasks, and familiarisation.

The roles listed above are presented in the basic version of Moodle 3, but the system makes it possible to create new roles and determine their rights and opportunities. So in particular in the LMS Moodle of the Chernihiv Taras Shevchenko National Teachers' Training University, the role of administration of the faculty (AdminFaculty) was introduced. The user with the role of AdminFaculty has the opportunity to view information about the students' estimates of the corresponding faculty.

The Structure of the E-learning Course

It is clear that in the framework of one LMS of the university, electronic training courses should have the same structure. For this by decision of the Academic Council of the University requirements regarding the structural elements of the electronic training course were adopted.

Elements of the e-learning course should include the following educational and methodological materials: information about the course and the teacher, general information about the discipline, teaching materials for each module (content module), and materials for the final evaluation.

Information about the course and the teacher is a small-volume information material on the discipline, which is placed in the preface to the e-learning course (description of the e-learning course). It should cover the following issues: a brief summary of the discipline, its purpose and tasks; a list of directions of training which the e-learning course is designed for; basic information about the teacher who is conducting this course.

General information about the discipline includes:
- the discipline programme – the purpose and tasks of studying the discipline, requirements for knowledge, skills and abilities (entrance and outgoing) of the student, a list of topics with short annotations; additionally (using an e-learning course for distance learning), there can be an hourly distribution of the study of each content module and the individual issues of these modules; it is represented by a resource like a web page;
- the thematic plan – themes and contents of lectures, seminars, practical or laboratory classes, independent work of the student, subjects of individual tasks; additionally (using an e-learning course for distance learning), there can be hourly planning of lectures, seminars, practical classes, and laboratory classes; it is represented by a resource like a web page;
- criteria for evaluation – data on the assessment system of students' academic achievements for the execution of various types of training activities (both current and final), the distribution of points for the execution of tasks, the scale of evaluation for each content module, the table of relations of national estimates to the ECTS estimates; they are represented by a resource like a web page;
- printed and Internet sources – basic and auxiliary printed sources on the discipline, Internet sources and Internet resources with active hyperlinks; they are represented by a resource like a web page or a database;
- the glossary – the main terms of the training course and their meanings; the author of the course decides on the need to link words in the glossary; it is represented by a resource like a glossary; and

- announcements – teacher announcements available for students, used to announce events or changes in the course, etc.; they are represented by a resource like a forum.

Educational and methodological materials for each module (content module) include:

- theoretical educational material – structured electronic teaching materials (content of teaching materials should reflect the logic of training by the course, provide the student with theoretical data of the module in full form, and be presented as a resource of lesson type), multimedia presentations of lectures, audio, video, animation training resources, reference and regulatory documents (forms, templates, standards, regulations, laws, etc.);
- additional materials (optional) –additional materials available for expanding students' horizons on the topic;
- practical (seminar, laboratory) work – separate resources for each practical (seminar, laboratory) work that contains the main structural elements: purpose and tasks (description of the skills and abilities necessary for the mastering of the topic), methodical instructions on their implementation, a list of individual tasks, forms of presentation of the results of the work, criteria of evaluation, a deadline; if necessary, there are additional structural elements: theoretical information or methodological resources of work, communicative instructions, references to them, sequence of work execution, graphic images, examples of tasks execution; laboratory works, for which special equipment and real objects are required, are performed in classroom conditions, as indicated in the formulation of the task; educational and methodological materials on practical (seminar, laboratory) works should be made in the form of web page (pages), links to various file formats, tasks, seminars; students can send the result of laboratory (practical) work to the teacher in electronic form to the training portal, submit it in paper form or in oral form; after reviewing and evaluating the tasks, the teacher should set points in the ejournal (gradebook);
- tasks for independent work of students – individual resources with tasks for independent execution, which contain the main structural elements: the subject, the purpose, additional theoretical material, examples of additional tasks, a list of individual tasks, instructions for their implementation, questions for discussion in synchronous or asynchronous modes, forms for submitting results, criteria and forms of evaluation, implementation time; if necessary, there are additional educational and methodological resources for self-study or reference to external information resources; the results of the task can be sent to the teacher in electronic form to the training portal, submitted in paper form or orally; after reviewing and evaluating the tasks, the teacher should set points in the e-journal;
- modular control – control questions, tasks with evaluation criteria and forms of presentation of the results of execution, tests (tasks) for self-control, and

a control test (task); such control is necessary to assess the knowledge, skills, and abilities acquired during the study of each module of the course; individual tasks, tests, and questionnaires using control questions can be used; and

• final control – control questions, tasks with evaluation criteria and forms of presentation of the results of execution, tests (tasks) for self-control, final test (task), examples of exam papers, description of the final evaluation; for the final attestation, a test (containing 30 test questions) can be used.

Educational and methodological materials of the electronic training course on disciplines should be structured according to the scheme (see Figure 2).
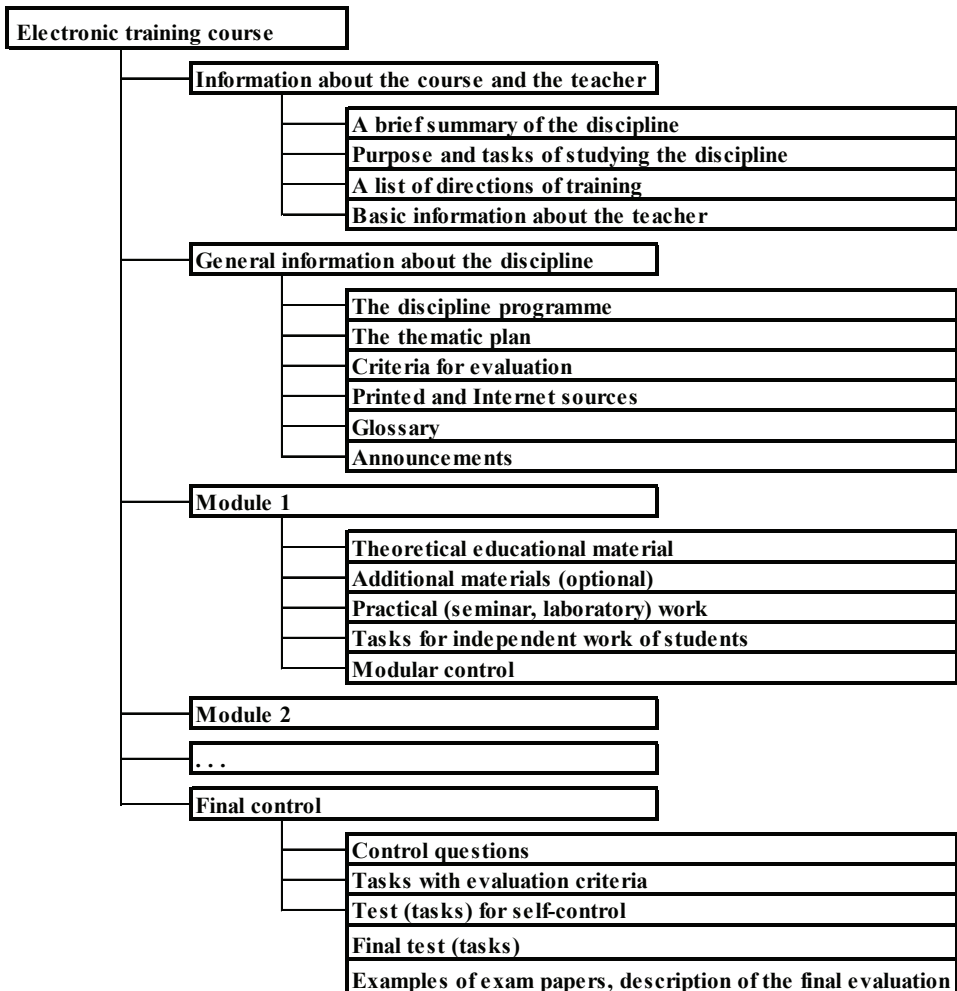

Figure 2. The block diagram of the electronic training course.

S o u r c e: Own work.

Conclusions

It can be noted that the use of the learning management system is an effective and convenient way of managing and spreading educational online content with sharing. A well-balanced and uniform structure of the e-learning course provides an opportunity for a more effective use of LMS.

Acknowledgements

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Andrii Kostiuchenko

Cechy implementacji systemu do zarządzania kursami na uniwersytecie ukraińskim

Streszczenie

W artykule poruszono kwestię regulacji prawnych towarzyszących wykorzystywaniu systemu do zarządzania kursami na ukraińskich uniwersytetach. Wskazano na typy elektronicznych zasobów edukacyjnych, które mogą być używane w kształceniu na odległość i podano ich definicje. Przedstawiono platformę Moodle jako przykład efektywnego systemu do zarządzania kursami. W szczególności zwrócono uwagę na role przyjmowane przez użytkowników tej platformy oraz przedstawiono ich listę. Zaproponowano ogólną strukturę kursu e-learningowego, który może zostać wdrożony przez instytucje edukacyjne.

Słowa kluczowe: kształcenie na odległość, szkolenie elektroniczne, elektroniczny zasób edukacyjny, system do zarządzania kursami, Moodle

Andrii Kostiuchenko

Особенности реализации системы управления обучением в образовательном процессе в украинском университете

Аннотация

В статье рассматривается вопрос регулирования системы управления обучением на государственном уровне Украины. Указываются типы и интерпретации электронных образовательных ресурсов, которые могут использоваться в дистанционном образовании. Рассматривается среда Moodle, как пример одной из успешных систем управления обучением. В частности, статья содержит список ролей, которыми могут пользоваться пользователи системы управления обучением. Предложена общая структура курса электронного обучения, который может быть использован учебными заведениями.

Ключевые слова: дистанционное образование, электронный учебный курс, электронный образовательный ресурс, система управления обучением, Moodle

Andrii Kostiuchenko

Características de la implementación del sistema de gestión del aprendizaje en el proceso educativo en una universidad ucraniana

Resumen

El artículo se dirige a estudiar la regulación del Sistema de Gestión del Aprendizaje a nivel estatal de Ucrania. Se señalan los tipos e interpretaciones de los recursos educativos electrónicos que se

puеden utilizar en la educación a distancia. Se considera el entorno Moodle como ejemplo de uno de los sistemas de gestión de aprendizaje exitosos. En particular, el artículo contiene una lista de roles que pueden compartir los usuarios de Learning Management System. Se propone la estructura general del curso de e-learning, que puede ser utilizado por las instituciones educativas.

P a l a b r a s   c l a v e: educación a distancia, curso de capacitación electrónica, recurso educativo electrónico, sistema de gestión del aprendizaje, Moodle

III
Methodological Aspects of E-learning and ICT Literacy Development

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Contemporary Teacher Competencies Development: A Study of ICT Tools for Professional Activities in Russia and Spain

Abstract

The paper examines the relations between teacher competencies and the specificity of the use of ICT tools in professional activities. The research was carried out within the frame of the IRNet project with the participation of two universities – the Herzen State Pedagogical University of Russia and the University of Extremadura, Spain. The results of the survey described give a general idea of various ICT tools use intensity in both countries. Overall, teachers take advantage of the electronic content capabilities for fostering students' motivation. Teachers benefit from ICT tools' efficiency and performance, and they use cloud technologies for supporting networking and collaboration. Spanish teachers appear to be more active users of ICT tools. They apply LMS more intensively, together with own lectures recordings and foreign language e-resources. For facilitating students' communication, they apply discussion forums and online lectures intensively. For management, the most popular tools are electronic organisers, criterial rubrics, and online polls. The choice of e-resources that teachers use is largely based on their communication preferences and ways to manage teaching; these e-resources aim at facilitating learners' cognitive activities. As in the case of the active use of LMS, the electronic system induces the application of available

communication means (e.g. forums, online lectures, etc.) together with the appropriate management capabilities (e.g. electronic organisers, criterial rubrics, online polls, etc.). The results of the survey can help identify problem areas in teachers' ICT competencies.

K e y w o r d s: ICT tools, teacher competencies, teaching activities, IRNet

Introduction: An Overview of the Approaches to Teacher Competencies Development

The digital environment expands human activities and enriches learning objectives with a spectrum of new knowledge and competencies. Today, a wide computer mediation of professional activities is obvious. This requires the development of ICT competencies. This idea has been emphasised throughout the last decades all over the world and is reflected in key documents. For example, in Europe, "the 2020 digital agenda underlines the wealth of opportunity opened up by the digital age for creating new educational scenarios and strategies" (Jiménez-Cortés, Vico-Bosch, & Rebollo-Catalán, 2017). In 2015 the Horizon Report emphasised the necessity of adapting educational scenarios to digital technologies (Johnson, Adams Becker, Estrada, & Freeman, 2015).

In general, ICT competencies are considered to be a complex of abilities to use ICT tools and applications in particular domains (Ilomäki & Kankaanranta, 2009). Together with ICT competencies goes a wide range of concepts – new literacies – which are the ways of learning that encompass the use of technology (Lim, Hung, & Cheah, 2009): media literacy, digital literacy, etc. One of the main goals of education is the development of learning skills (Dabbagh, Kitsantas, Al-Freih, & Fake, 2015), and social skills or soft skills (Gibert, Tozer, & Westoby, 2017). In Russia, this trend is also visible. At school, the main goal is the development of so-called universal learning activities, that is, a set of skills that form a person's ability to self-improve through the assimilation of a new social experience. These activities include four groups – personal, cognitive, communicative, and regulatory ones. Learning activities create the prerequisites for mastering the strategy of lifelong learning.

Today we are talking about e-pedagogy, the pedagogy of knowledge society (Smyrnova-Trybulska, Noskova, Pavlova, Yakovleva, & Morze, 2016). In Russia, new approaches to developing competencies of future teachers are reflected by modern educational standards that are being gradually developed and improved. Moreover, the requirements for the professional activity of a teacher are manifested in the professional standard of a teacher, which was approved and started to be

applied in 2017. Professional ICT competence is understood as a qualified use of ICT tools common in this professional field when solving professional problems. Professional pedagogical ICT competence includes general ICT competence, general pedagogical ICT competence, and subject-oriented pedagogical ICT competence (reflecting the professional ICT competence of the relevant field of human activity). It is necessary to formulate detailed qualification requirements (a system of indicators), which will describe ICT competence of teachers in accordance with the level of their qualifications (Avdeeva & Uvarov, 2016). The work in this direction is going on and is being actively discussed by researchers and teachers.

In Spain, the educational system also fosters to achieve basic skills at the end of the compulsory education. One of them is digital competence as it is included in the national education law, LOMCE (2013). This competence implies having the skills to search, obtain, process, and communicate information, and to transform it into knowledge. It incorporates different skills, ranging from access to information, to its transmission in different media once treated, including the use of information and communication technologies as an essential element to inform, learn, and communicate (ITE, 2008).

Therefore, the education system must be prepared to cope with these advances, teacher training being the key element to facilitate the curricular implementation of ICT. This should be geared towards innovating, experimenting with ICT tools and reflecting on their use, and turning them into one more resource within the classroom.

At the same time, the European Commission at the beginning of the 21st century (2003, p. 18) clearly indicated that there was a deficit in ICT training for teachers in two areas: (1) linking ICT to pedagogical practices, and (2) linking ICT in relation to disciplines and the promotion of interdisciplinarity. However, in recent decades, this problem has not been completely solved. In fact, some political actions from governments show their concern about the Digital Teacher Training Competence. For instance, according to the definition offered by the Digital Teacher Competence Portfolio of Extremadura (2015), the digital competence is understood as "[…] insurance and critical technologies of the information society for work, leisure and communication use and combination of knowledge, skills, values and attitudes that achieve certain goals effectively in contexts and with digital tools."

This distress makes it necessary to train teachers due to the functions that ICT tools play and their impact on critical variables within the teaching and learning process, together with the different roles that a teacher plays in them. A reflection of such general social concern has been the special interest that has aroused the need to know and promote the levels of teachers' digital competence at all levels of education (Aguiar & Llorente, 2008; Cabero, Llorente, Leal, & Lucero, 2009). For these reasons, the training of teachers is a priority, since the school cannot leave aside the society demands. ICT require that teachers play new roles, and entail innovative pedagogies and new educational approaches in teacher training (Makrakis, 2005).

In accordance with Valverde (2015) and Kharbach (2012), those competencies must be identified in pre-service teachers' training (Gutiérrez Esteban & Luengo González, 2008) and linked to the shared experiences of "collaborative learning, which allow self-regulation of individual learning and the construction of these networks that shape and give meaning to the community of mobile learning. Another of the advances m-learning gives to teachers is the possibility of easy use, communication facilities and faster diffusion. It allows quick interchange and discussion among our Mobile Personal Learning Networks (MPLN)" (Gutiérrez & Camacho, 2017, p. 365).

Here we should note the differences in the aims of school and university education. Of course, for the university the main goal is professional development, as well as self-development. In the context of university education, we can talk about the wider use of ICT not just for supporting the educational process, but for implementing blended learning and creating an electronic educational environment.

Today, professional competencies of a teacher can hardly be separated from ICT competencies. The competent use of ICT tools is the indispensable condition for a successful professional activity. Therefore, in the context of our research, we consider these two phenomena – teacher competencies and ICT tools for professional activities – in a logical unity.

Pedagogical ICT Tools

The achievement of a new quality of the educational process and the orientation towards innovative results in the electronic environment require setting new goals and using special tools of professional activity. It is obvious that a teacher needs to master new tools in order to make an entire use of the high potential of the electronic environment.

In Russian pedagogical studies, what is quite widespread is the approach according to which five groups of pedagogical tools that are used in the creation of electronic educational resources are identified: interactive, multimedia, modelling, communication, and productivity (Osin, 2007). Despite the name "tools," this idea in fact represents the quality of the electronic educational resources content, which determines new opportunities for the resource use in the educational process.

For Area, Gutiérrez, and Vidal (2012), in the case of teaching materials based on technologies, the main characteristics of these digital materials are: hypertextuality, multimedia, and interactivity. At the same time, Graña classifies digital educational resources according to the following criteria (2011):

1. News: this category includes reference books and documents containing structured information, but not for an educational purpose a priori. The con-

sultation is open in the sense that they have a pre-established itinerary (podcasting).

2. Instructional: these materials are designed according to training needs. Navigation through the content menu is preset as well as learning sequences. One can define several instruction sequences in the same content of the previous knowledge base or the learning rate. Within this category there are: exercise activities, interactive tutorials, e-learning courses.

3. Evaluative: they constitute a variation of instructional materials and have a purely evaluative purpose. Self-assessment questionnaires, training tests, summative assessment, and opinion surveys are distinguished.

4. Instrumental: these are interactive services or applications that cover many aspects of learning support, including tools for the search, processing, and visualisation of information. These applications are free navigation. The examples are: search engines virtual atlas, calculators, translators, etc.

5. Experiences: these are interactive training scenarios that are based on games or simulations. They promote learning based on problem-building and strategic decision-making skills. There is a wide range of simulations and games that respond to these characteristics. We find levels of experiences with low content of interactivity (some WebQuest modalities) or highly interactive (scientific simulations and virtual worlds).

6. Conversational: conversational materials and services consist of synchronous or asynchronous communication dialogues in which there are conversations between participants in a training activity. Conversations can be open (group) or closed (see teacher). The examples are: mailing lists, forums, chat, instant messages, comments, blogs, audio and videoconferences, etc.

7. Collaboration: this type of material includes a wide range of work proposals for this purpose: databases, encyclopedias, reports, articles, notes, manuals and guides, networked lectures, from activities fully open to highly formalised. One can also activate from a few users to very large communities. This network shows how to make interaction between people and the management of shared knowledge. Representative examples of this category are many of the telematics projects, Wiki environments and management within a network oriented to the applications of knowledge.

When choosing the most appropriate educational ICT tools for a particular educational situation, a number of factors may be influential, but – ideally – a reasonable variety of methods and resources should be used to make it possible for students to participate, illustrate their ideas, investigate, and find solutions to problems in order to favour the acquisition of learning.

Regarding the use of technological means in education, traditionally some mistakes have been made while "transferring" the didactic situation into the cyberspace, and taking the teaching methods and learning strategies of a live classroom to the virtual formative environments. Namely, these strategies and methods

were tailor-made and thought for face-to-face teaching. This kind of implementation without adaptation has not been a successful measure, since we have brought into virtual teaching the way of thinking present in face-to-face teaching.

In the international pedagogical practice, ICT tools are characterised through the prism of solving specific educational problems. In particular, the annual rating of the most popular ICT tools has gained popularity (http://c4lpt.co.uk/top100 tools/). Open voting through filling out online questionnaires forms it. Here, the tools are sorted by several categories: tools for providing new knowledge (instructional tools), tools for developing content, social tools, and tools for personal and professional purposes. However, the rating does not provide a clear definition of what ICT tools mean in the educational context.

There are also approaches which characterise ICT tools from the standpoint of implementing specific pedagogical methods: for gamification (de Marcos, Garcia Lopez, & Garcia Cabot, 2016), for increasing the effectiveness of MOOCs (Yamada, 2016), or for supporting the development of universal learning activities (Zhuravlev, 2015). A number of publications show that the term "ICT tools" refers to information and communication technologies used for educational purposes (Lucke, Dunn, & Christie, 2017). Authors describe the usefulness, appropriateness, and efficacy of specific ICTs. In addition, they recommend certain ICT tools for specific pedagogical objectives.

At the same time, the cited publications do not analyse significant changes in the activity of a teacher when using these ICT tools. There are no grounds for their division into groups, since a certain ICT tool can be applied in different ways in different educational situations. Therefore, it is necessary to determine the theoretical grounds for using the concept of "pedagogical" ICT tools.

ICT tools in the hands of a teacher have evolved from merely a learning tool into a multifunctional tool for creating various educational opportunities for learners' self-guided work, and for designing and shaping an electronic educational environment. The main purpose of pedagogical ICT tools is to organise and support the activities of students in the electronic educational environment (both in the classroom and outside). Pedagogical ICT tools play a special role in the organisation of out-of-class independent work.

In this paper, we suggest the classification of pedagogical ICT tools based on the focus of different types of students' activities organised and facilitated in the electronic environment:

- ICT tools for presenting and organising learning information acquisition in the electronic environment;
- ICT tools for organising educational communication in the electronic environment; and
- ICT tools for managing educational and cognitive activities in the electronic environment.

ICT Tools Application by Russian and Spanish Teachers

Research Methods

An experimental study of the use of ICT tools by teachers was carried out within the IRNet project (http://www.irnet.us.edu.pl). In this paper, we focus on the results obtained by Russian and Spanish research teams. The research included several stages.

Firstly, a questionnaire was elaborated. The main objective was to identify the specific application of the three main groups of ICT tools in the electronic educational environment by teachers: ICT tools for presenting and organising learning information acquisition in the electronic environment, ICT tools for organising educational communication in the electronic environment, and ICT tools for managing educational and cognitive activities in the electronic environment. In each of the questions, respondents were asked to assess the degree of application or preference of ICT tools on a 5-point scale (1 point – never or almost never, 2 points – very rarely, 3 – rarely, 4 – quite often, 5 – very often or constantly). The questionnaire was designed for teachers and specialists in the field of education (school teachers, academic teachers, methodologists, etc.) who actively use ICT in their professional activities, understand the essence and specificity of e-learning, and have a sufficient experience in using distance education technologies to facilitate students' activities.

Secondly, all questions were presented in Russian and English with the aim of disseminating this experience, as well as attracting the necessary number of respondents from Spanish universities and schools. The questionnaire passed the initial validation: it was analysed, and each issue was evaluated and commented on by Russian and Spanish experts. Some of the issues were modified (content or style) as recommended by the scientific community.

As we have already noted, the questionnaire comprised three groups of questions. The first group (ICT tools for presenting and organising learning information acquisition in the electronic environment) included questions that allowed obtaining data on several areas:

- an extent to which various ICT tools and electronic equipment are used for presenting educational information (for example, computers, multimedia projectors, document cameras, LMS, sites, mobile devices, virtual and augmented reality interfaces, etc.);
- a variety of electronic content used (linear texts in electronic form, hypertext, computer presentations, video, audio, interactive digital models, virtual and augmented reality); and
- a variety of opportunities for learning the content (selecting the necessary content, choosing the preferred formats of educational content, contextual

help, automated self-control, the ability to interactively manipulate learning objects, etc.).

In addition, two questions were proposed that allowed determining the correlation between the e-resources actually used by teachers and the opinion of teachers about the relevance of these types of e-resources for students. In particular, the questions named such e-resources as electronic textbooks, text and hypertext resources of own development, records of own lectures, digital educational objects, tests, e-resources in foreign-language, open online courses, etc.

The second group of questions (ICT tools for organising educational communication in the electronic environment) covered several aspects:

- a variety of communication ICT tools use in teaching activities (e-mail, forums, blogs, social networks, multi-user documents, multi-user virtual environments, video conferencing facilities, etc.);
- opportunities provided to students for networking and communication (individual support, application of knowledge and skills in practice, support of educational motivation, formation of professional and social competencies, support of educational self-fulfilment and satisfaction of individual communication request, etc.); and
- a variety of resources helping organise educational communication on the web (rules, regulations, conditions of network interaction, problematic issues, situations, topical issues of discussion, archives of discussions, links to external resources, etc.).

In addition – as in the first group – two questions were proposed to identify the correlation between the means of interaction actively used by teachers and students' demand for these tools (counseling, pair and small group work, discussions, network conferences, online lectures and seminars, etc.).

The third group of questions (ICT tools for managing educational and cognitive activities in the electronic environment) primarily aimed at identifying an extent to which various ICT tools are used to manage educational and cognitive activities in the electronic environment (electronic calendars and organisers, network questionnaires, criterial rubrics editors, testing programmes, mobile on-line polls, learning analytics, etc.). Two questions were proposed to identify the correlation between ICT tools used for managing educational and cognitive activities and the relevance of these tools for students (plans, graphs, online questionnaires, tests, online voting, evaluation criteria, ratings, electronic journals of progress and achievement, electronic portfolio).

Finally, a quantitative and qualitative analysis of the results was carried out using Google Form tools and Statistical software (statsoft.com). For each variable, the following parameters were calculated: mean, or average – M, standard error – SE, standard deviation – SD, and standard error of the mean – SE(M). Of all the results obtained, we selected only those that have statistically significant differences. The quantitative and qualitative analysis of the obtained results shows

general trends in the use of ICT tools by Russian and Spanish teachers. In addition, the distinctive differences were determined in the preference of ICT tools. Consequently, we see the prevailing directions of ICT tools use.

Research Results
The research sample

The research sample included 65 respondents in total, 19 from Spain and 46 from Russia (Figure 1). The larger part of the respondents were academic teachers (89%) with a certain teaching experience (92% of the respondents – more than 5 years), together with the sufficient practice in implementing ICT in their professional activities (89% – more than 5 years). Consequently, the respondents can be considered the representatives of the advanced part of the pedagogical community.
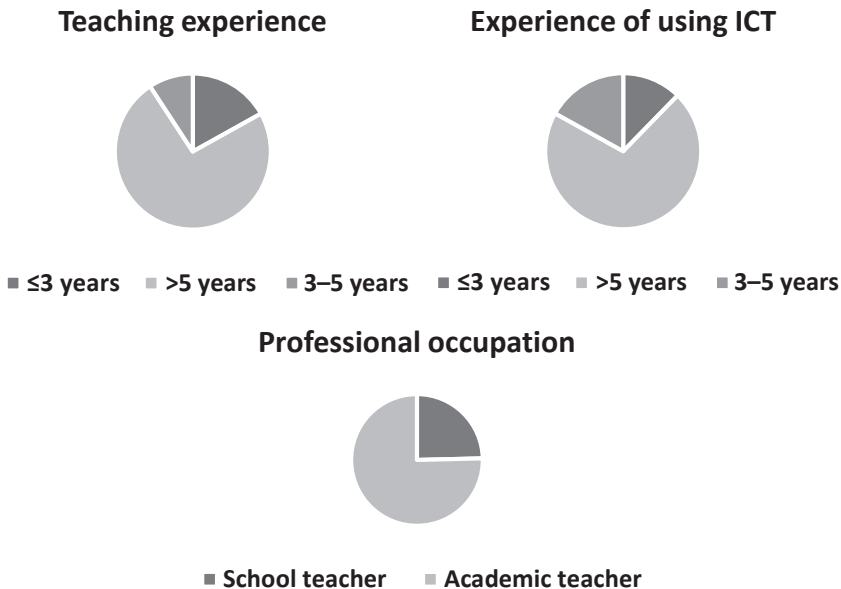
Figure 1. The research sample.

S o u r c e: Own work.

Some trends in the use of ICT tools by teachers

Russian and Spanish teachers are very active in using multimedia equipment in their professional activities (92% of Russian and 100% of Spanish colleagues chose the options "quite often" and "constantly"). Computer presentations are in the first place in popularity of all electronic content. Thematic sites are also popular (they are constantly used by 66% of Russian and 55% of Spanish teachers). Mobile devices are less popular – 52% of Russian and 50% of Spanish respondents indicated that they are used very rarely. A similar situation is revealed in the field of

application of virtual and augmented reality interfaces – 74% of teachers in Russia and 70% of teachers in Spain almost never use them.

Teachers note the importance of the choice of e-content (variability and diversity). These opportunities are actively implemented by 61% of Russian and 70% of Spanish teachers. In addition, the variety of choices of educational content formats has a value (62% and 75% of Russian and Spanish teachers, respectively, actively use these opportunities). Motivating resources are used quite actively (54% and 55%). About a half of teachers actively provide students with the opportunities for automated self-control (50% and 40% note that they offer these opportunities very often).

The use of e-mail is equally in demand by all teachers. Cloud documents are quite in demand (48% and 60%). All interviewed teachers noted that they actively seek to provide students with a range of opportunities that network communication has. These are individual communication support, application of knowledge and skills in practice, joint activities, support of educational motivation, reflexive position, formation of professional and social competencies, and support of educational self-realisation and satisfaction of individual communication request. In this aspect, there are no significant differences between countries; the number of active teachers in each case exceeds 50–60%.

Also, what is revealed is the direct correlation between the applicability of ICT tools by teachers in both countries and their assessment of the relevance of these tools to students (the Pearson correlation coefficient varies within 0.7–0.8). This result can be explained from two points of view. On the one hand, it may prove that teachers are well aware of learners' needs and aspirations. On the other hand, this may partially indicate the leading, somewhat authoritarian position of teachers who believe that students need exactly those forms and methods of teaching that they offer. In any case, this question requires an additional study of students' preferences. This may be the next step in the continuation of the study.

Differences in the application of ICT tools by Russian and Spanish teachers

ICT tools for presenting and organising learning information acquisition in the electronic environment

The differences between the two countries are presented in Table 1 and Figure 2. In relation to ICT tools employed for presenting and organising learning information acquisition, the most significant differences were revealed in terms of LMS application, together with "own lectures recordings" and "foreign language e-resources." It should be noted that LMS presents the highest rate, due to which it is a widespread tool in the university educational level area. Spanish teachers use these tools more intensively because they have more extensive experience in the implementation of e-learning. Undoubtedly, LMS provides high adaptability to the user's demands (teachers), the reports offered to teachers regarding students' learning progress, their improvements and involvements, and mainly their practices within this digital scenario. Also, what is remarkable is the possibility to implement

external resources within the LMS, such as social networks, RSS, video channels, and other tools that enrich students' educational experiences and foster learning but also skills acquisition thanks to multifarious teaching materials and diverse educational tools, on the basis of the transmedia narrative and the multiliteracies theories.

Spanish teachers are more actively using LMS, so it can be assumed that they also apply own lectures recordings based on LMS. It is obvious that the realities of close interaction within the European Union also encourage Spanish teachers to use foreign language e-resources more actively.

Table 1.

Differences in the use of ICT tools for presenting and organising learning information acquisition in the electronic environment

	LMS				Own lectures recordings				Foreign language e-resources			
	M	N	M±SE	M±SD	M	N	M±SE	M±SD	M	N	M±SE	M±SD
Russia	2.78	46	1.65	0.24	2.35	46	1.58	0.23	2.26	46	1.47	0.22
Spain	4.00	19	1.20	0.28	3.47	19	1.39	0.32	3.32	19	1.67	0.38
Total	3.14	65	1.62	0.20	2.68	65	1.60	0.20	2.57	65	1.59	0.20

S o u r c e: Own work.
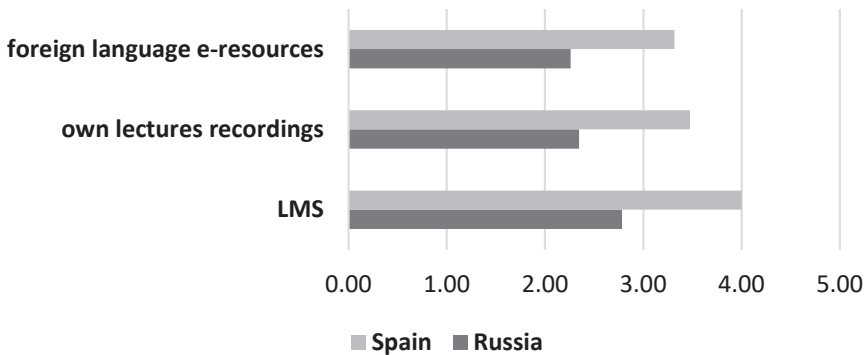
Figure 2. The use of ICT tools for presenting and organising learning information acquisition.

S o u r c e: Own work.

ICT tools for organising educational communication in the electronic environment

The differences between the two countries are presented in Table 2 and Figure 3. We presume that the activity of Spanish teachers in the application of LMS is related to their preferences in the ICT tools for organising educational communication. ICT tools that they apply are available in LMS, and they provide rich opportunities for facilitating communication and interactions. Teachers mainly make use of forums.

Less intensively, they use online lectures. It is important that most of teachers provide learners with rules, regulations, and terms of network interactions since it is a significant condition for an effective mediated communication.

Table 2.

Differences in the use of ICT tools for organising educational communication in the electronic environment

	Forums				Online lectures				Rules, regulations, terms of network interaction			
	M	N	M±SE	M±SD	M	N	M±SE	M±SD	M	N	M±SE	M±SD
Russia	2.63	46	1.47	0.22	2.22	46	1.55	0.23	3.02	46	1.58	0.23
Spain	4.21	19	1.18	0.27	3.26	19	1.63	0.37	4.16	19	1.34	0.31
Total	3.09	65	1.56	0.19	2.52	65	1.63	0.20	3.35	65	1.60	0.20

S o u r c e: Own work.
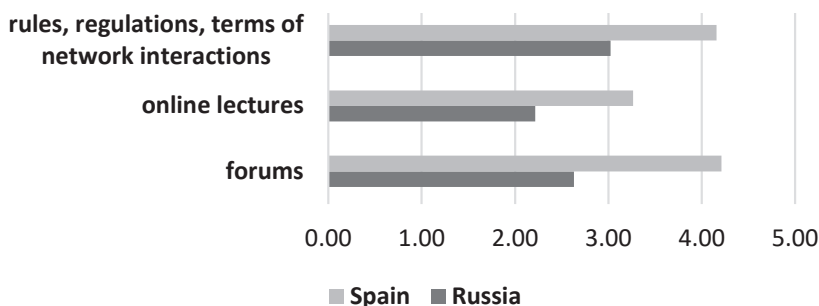
Figure 3. The use of ICT tools for educational communication on the web.

S o u r c e: Own work.

ICT tools for managing educational and cognitive activities in the electronic environment

The differences between the two countries are presented in Table 3 and Figure 4. In both countries, teachers tend to use ICT tools for organising learning information acquisition in order to know students' academic achievements by using online polls. However, there are some differences in choosing criterial rubrics and electronic organisers, with different frequency for both tools. In general terms, it seems to be that Spanish teachers repeatedly use this kind of tools, unlike their Russian colleagues. We can again logically relate this trend to the usage of LMS application by Spanish teachers. The latest editions of the most well-known LMS have wide built-in capabilities for implementing objectives of educational and cognitive activities management.

Table 3.

Differences in the use of ICT tools for managing educational and cognitive activities in the electronic environment

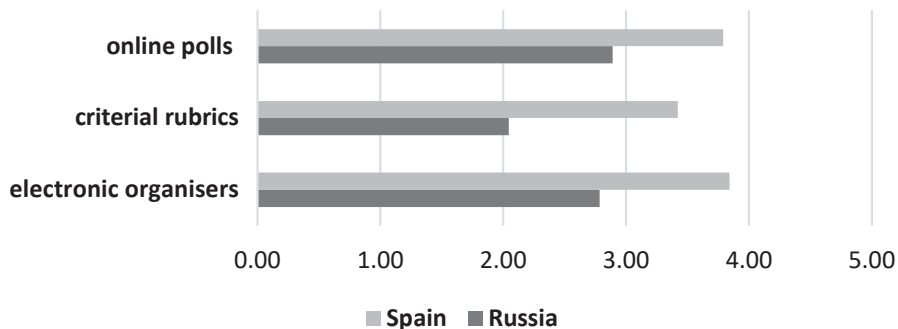|	Electronic organisers				Criterial rubrics				Online polls			
	M	N	M±SE	M±SD	M	N	M±SE	M±SD	M	N	M±SE	M±SD
Russia	2.78	46	1.59	0.23	2.04	46	1.43	0.21	2.89	46	1.62	0.24
Spain	3.84	19	1.61	0.37	3.42	19	1.64	0.38	3.79	19	1.51	0.35
Total	3.09	65	1.66	0.21	2.45	65	1.61	0.20	3.15	65	1.63	0.20

S o u r c e: Own work.

Figure 4. The use of ICT tools for managing educational and cognitive activities.

S o u r c e: Own work.

Conclusion

The results show the current tendency of teachers from Russia and Spain regarding the ICT tools use. Teachers take advantage of the electronic content capabilities – for example, multimedia and interactivity – for fostering motivation. In addition, they benefit from ICT tools' efficiency and performance, for instance while actively implementing automated tests and learning analytics. Moreover, they use cloud technologies not merely as a tribute to fashion, but for supporting networking and collaboration. Teachers tend to understand that the main advantage of ICT tools is an opportunity for a teacher to go beyond in-class interactions and to provide learners with a certain freedom in educational and cognitive activities, taking into account the opportunities and specificity of information and communication behaviour of young people. ICT tools and new activities make it possible for teachers to create electronic educational environments where learners not only master the necessary competencies, but also get the opportunity for self-

realisation, personal development, and professional development. Teachers are aware of students' aspirations regarding ICT tools offered; however, the extent of such awareness still needs further investigation.

E-resources that teachers use influence their communication preferences and ways to manage teaching and learners' cognitive activities. For example, the active use of LMS by Spanish teachers induces the application of available communication means (e.g., forums, online lectures, etc.) together with the appropriate management capabilities (e.g., electronic organisers, criterial rubrics, online polls, etc.).

ICT tools allow implementing the necessary transformations in the activities of a modern teacher, which are aspects of new professional competencies related to pedagogical activity in the electronic educational environment. Teachers of the 21st century should learn how to use different types of pedagogical ICT tools and design with their help an electronic educational environment for creating conditions for professional formation, self-education, and self-realisation of the digital learners. Consequently, in the process of advanced training and education of teachers today, it is necessary to strengthen the direction of the ICT competencies development as the basis for effective professional activity in the electronic educational environment.

A feature of modern ICT tools is their rapid development and renewal. In this regard, the possibilities of using pedagogical ICT tools are constantly expanding. Among the current trends, we can name the switch to mobile formats, the expansion of the augmented and virtual reality, etc. Thus, teachers need to improve ICT competencies constantly to show professional creativity in the search of effective methods of educational interaction in the electronic environment.

The results of the conducted survey can help identifying problem areas in teachers' ICT competencies. For example, which ICT tools should be learnt, what educational opportunities in the electronic environment should be paid attention to, what digital educational resources are needed for this, and how to take into account students' preferences? Moreover, the further study directions can include the overview of the results from the sociocultural prospective, since the countries participating in the research have significantly different pedagogical and ideological backgrounds.

Acknowledgements

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Rozwój kompetencji współczesnych nauczycieli: analiza narzędzi ICT dla działalności zawodowej w Rosji i Hiszpanii

S t r e s z c z e n i e

Artykuł analizuje powiązania między kompetencjami nauczycieli a specyfiką wykorzystania narzędzi ICT w działalności zawodowej. Badanie przeprowadzono w ramach projektu IRNet z udziałem dwóch uczelni – Państwowego Uniwersytetu Pedagogicznego Rosji im. A.I. Herzena i Uniwersytetu Extremadura w Hiszpanii. Wyniki zawierają przegląd intensywności korzystania z różnych narzędzi ICT w obu krajach. Ogólnie nauczyciele wykorzystują możliwości treści elektronicznych do stymulowania motywacji uczniów. Korzystają z technologii informacyjno-komunikacyjnych dla zwiększenia produktywności i wykorzystują technologię chmury w celu wspierania pracy zespołowej studentów. Nauczyciele hiszpańscy aktywniej korzystają z niektórych narzędzi ICT. Bardziej intensywnie stosują LMS wraz z własnymi wykładami i zasobami elektronicznymi w językach obcych. Fora dyskusyjne i wykłady online intensywnie wspierają interakcję uczniów. W rozwiązywaniu problemów związanych z zarządzaniem najbardziej popularne są organizacja elektroniczna, kategorie kryterialne i kwestionariusze online. Zasoby elektroniczne, z których korzystają nauczyciele, w dużej mierze wyjaśniają ich preferencje komunikacyjne, sposoby zarządzania uczeniem się i przyczyniają się do aktywności poznawczej uczniów. Podobnie jak w przypadku aktywnego korzystania z LMS, system elektroniczny zachęca do korzystania z dostępnych środków interakcji (na przykład forów, wykładów online) oraz z odpowiednich możliwości zarządzania (np. elektronicznej organizacji, kwestionariuszy online itp.). Wyniki badań pozwoliły zidentyfikować obszary problemowe w rozwoju kompetencji nauczycieli ICT.

S ł o w a   k l u c z o w e: narzędzia ICT, kompetencje nauczycieli, działalność dydaktyczna, IRNet.

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Развитие компетенций современных учителей: исследование ИКТ-инструментов профессиональной деятельности в России и Испании

А н н о т а ц и я

В статье рассматриваются связи между компетенциями преподавателей и спецификой использования ИКТ-инструментов в профессиональной деятельности. Исследование проводилось в рамках проекта IRNet с участием двух университетов – Российского государственного педагогического университета им. А.И. Герцена и Университета Эстремадуры, Испания. Результаты дают общее представление об интенсивности использования различных ИКТ-инструментов в двух странах. В целом, учителя используют возможности электронного контента для стимулирования мотивации студентов. Они применяют ИКТ для повышения производительности и используют облачные технологии для поддержки совместной работы

студентов. Испанские учителя более активно используют некоторые инструменты ИКТ. Они более интенсивно применяют LMS вместе с записями собственных лекций и электронными ресурсами на иностранных языках. Для поддержки взаимодействия студентов интенсивно применяют дискуссионные форумы и онлайн-лекции. Для решения задач управления наиболее популярными являются электронные органайзеры, критериальные рубрики и онлайн-опросы. Электронные ресурсы, которые используют преподаватели, в значительной степени объясняют их коммуникационные предпочтения, способы управления обучением и способствуют познавательной деятельности учащихся. Как в случае активного использования LMS, электронная система стимулирует применение доступных средств взаимодействия (например, форумы, онлайн-лекции), вместе с соответствующими возможностями управления (например, электронные организаторы, критерии, онлайн-опросы и т. д.). результаты исследования позволили выявить проблемные области в развитии ИКТ-компетенций педагогов.

К л ю ч е в ы е с л о в а: ИКТ-инструменты, компетенции преподавателей, преподавательская деятельность, IRNet

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Desarrollo de competencias docentes: un estudio del uso de las herramientas TIC en las actividades profesionales en Rusia y España

R e s u m e n

El artículo estudia las relaciones entre las competencias docentes y el uso de las herramientas TIC en las actividades profesionales. Esta investigación se llevó a cabo en el marco del proyecto IRNet con la participación de dos universidades – Herzen State Pedagogical University of Russia y la Universidad de Extremadura, España. Los resultados de la encuesta dan una idea general de las diversas herramientas de TIC que se utilizan intensamente en ambos países. En general, el profesorado aprovecha las herramientas de contenido digital para fomentar la motivación de los estudiantes. Se benefician de la eficiencia de las herramientas TIC, el rendimiento y el uso de tecnologías en la nube para apoyar el trabajo en red y la colaboración. El profesorado en España parece ser usuarios más activos de las herramientas TIC. Éstos emplean de manera más frecuente LMS, junto con grabaciones propias de conferencias y e-recursos de lenguas extranjeras. Para facilitar la comunicación con los estudiantes, utilizan intensivamente foros de debate y conferencias en línea. Para la gestión, los más frecuentemente utilizados son las bases de datos, rúbricas y encuestas en línea. Los e-recursos que usa el profesorado con más asiduidad, traen aparejadas sus preferencias de comunicación, el modo en el que administran la enseñanza y facilitan las actividades cognitivas de los alumnos. Como en el caso del uso activo de LMS, el sistema digital induce a la aplicación de los medios de comunicación disponibles (por ejemplo, foros, conferencias en línea, etc.), junto con otras herramientas de gestión apropiadas (por ejemplo, bases de datos, rúbricas, encuestas en línea, etc.). Los resultados de esta investigación pueden ayudar a identificar áreas problemáticas en la formación de competencias TIC del profesorado.

P a l a b r a s c l a v e: herramientas TIC, competencias docentes, actividades docentes, IRNet

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Objectives and Content of the Mathematics E-learning Course Preparing Students for the School-leaving Exam in Mathematics

Abstract

Information and communication technologies (ICT) can help solve the problems connected with forming mathematical competencies in students and are used in the process of teaching mathematics. The first part of the paper presents the theoretical background of the subject matter, including: the description of mathematical competencies and their identification at secondary school in Poland, Niemierko's taxonomy, the programmed learning theory, and the structure of the system of education/learning in the e-learning environment. It expresses the preconditions, expected results, concepts, objectives, hypotheses, and research methods. The practical part describes the structure of "Mathematics with Moodle," a system for individual learning based on the original authorial *MatLearn* module, and its graphic representation. A didactic tool is proposed – an e-learning course preparing students for the school-leaving exam in mathematics and improving students' mathematical competencies. Its aim is to increase the level of competencies, especially those which have not been mastered yet. In order to construct study activities in the course, the programmed learning principles and Niemierko's taxonomy were used.

K e y w o r d s: information and communication technologies (ICT), key competencies, mathematical competencies, e-learning, Niemierko's taxonomy, programmed learning, *MatLearn* module, Mathematics with Moodle

Introduction

Mathematical competence and basic competencies in science and technology are ranked third in the list of "eight key competences for lifelong learning" ("Key competences for lifelong learning…," 2007, p. 3). Key competencies were defined, developed, and accepted in the document "Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning." The document says: "Competences are defined here as a combination of knowledge, skills and attitudes appropriate to the context. Key competences are those which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment" ("Recommendation…," 2006).

"Recommendation" states eight key competencies:
1) communication in the mother tongue;
2) communication in foreign languages;
3) **mathematical competence and basic competences in science and technology**;
4) digital competence;
5) learning to learn;
6) social and civic competences;
7) sense of initiative and entrepreneurship; and
8) cultural awareness and expression ("Recommendation…," 2006).

Mathematical competence can be found in the currently applicable new mathematics core curriculum in accordance with the Regulation of the Minister of National Education (in 2012) on the core curriculum for pre-school child development and general education in specific types of schools (Journal of Laws 2012, item 977, p. 245).

An analysis of the Programme for International Student Assessment (PISA) findings carried out since 2003 shows the results in mathematics in Poland – the highest number of students is at the average level. It can also be noticed that the abovementioned results have remained at the same level for the long time, and the level of mathematical competence of students has not increased. With reference to Polish graduation exams in mathematics, which are obligatory, a visible decrease of certain mathematical competencies has been noticed. In order to solve this problem and increase the level of certain skills and knowledge – in particular those least mastered by students – we try to improve the process of teaching mathematics by developing a course for individual learning of mathematics supported by ICT.

After graduating from the primary school, a student continues general education at the third and the fourth stage of education. The third stage of education in Poland is executed in middle schools, whereas the fourth stage of education is executed in secondary schools. Although they are executed in two different types of schools, the third and the fourth stage of general education form a coherent whole

and constitute a basis of education, making it possible to gain varied professional qualifications and to improve or modify them at a later stage, opening the process of lifetime education.

In accordance with the Regulation, an important aim of the school at the third and the fourth stage of education is to prepare students for living in the information society. Teachers should create favourable conditions for students to gain skills in searching, ordering, and using information from different sources with the application of ICT from different subjects. The Regulation also contains teaching content, that is, detailed requirements concerning mathematics at the fourth stage of education.

The main purpose of the research is to develop and assess the system for learning mathematics with the application of ICT, the element of which is a didactic tool – an e-learning course which contains a teaching module developing mathematical competence of students. It is enriched with elements of programmed learning and applies the principle based on the gradual increase of the difficulty level.

Mathematical competencies are also very important in the context of STEM education and the future career of young people, whose choices are influenced, on the one hand, by appropriately directed education at the lower stages of education, and, on the other hand, by the demand for specialists in the scope of applied studies: science, technology, engineering, and mathematics.

STEM Education: Background

As Larson (2017) stresses, "STEM education is a focus of many policy makers, business and industry leaders, philanthropic foundations, and education leaders because the data indicate there will be accelerated growth in the number of STEM jobs the economy will generate over the next decade, particularly compared to other professions (see, for example, STEM 101: Intro to tomorrow's jobs). Additional data indicate beginning salaries and salary growth for STEM majors will outpace those for other majors and careers."

Escuder and Furner (2012) note that "The President's Council of Advisors on Science and Technology (PCAST) released an executive report in November 2010 where specific recommendations to the administration are given to ensure that the United States is a leader in Science, Technology, Engineering, and Mathematics (STEM) education in the coming decades. One of the recommendations is to recruit and train 100,000 new STEM middle and high school teachers over the next decade that are able to prepare and inspire students and have strong majors in STEM fields and strong content-specific pedagogical preparation. PCAST regards teachers as the most important factor in ensuring excellence in STEM education. Despite the ongoing efforts to promote the use of technology in education (e.g., National Council of Teachers of Mathematics [NCTM], 2000; National Educational Technology Standards for Teachers [NETS.T], 2008), teachers' ineffective use of

technology has been reported in the literature. One reason frequently cited is that teachers are not trained in utilizing technology in the classroom within context" (Escuder & Furner, 2012, p. 76).

According to Kelley and Knowles (2016), "The global urgency to improve STEM education may be driven by environmental and social impacts of the twenty-first century which in turn jeopardizes global security and economic stability. The complexity of these global factors reach beyond just helping students achieve high scores in math and science assessments. Friedman (2005) helped illustrate the complexity of a global society, and educators must help students prepare for this global shift. In response to these challenges, the USA experienced massive STEM educational reforms in the last two decades. In practice, STEM educators lack cohesive understanding of STEM education. Therefore, they could benefit from a STEM education conceptual framework."

Other researchers, Schmidt and Fulton (2016) observe in their study that "The need to prepare students with 21st-century skills through STEM-related teaching is strong, especially at the elementary level. However, most teacher education preparation programmes do not focus on STEM education." Schmidt and Fulton's (2016) "findings suggest that while inquiry-based STEM units can be implemented in existing programmes, creating and testing these prototypes requires significant effort to meet PSTs' learning needs, and that iterating designs is essential to successful implementation" (Schmidt & Fulton, 2016, p. 302).

Returning to Kelley and Knowles (2016), "The process of integrating science, technology, engineering, and mathematics in authentic contexts can be as complex as the global challenges that demand a new generation of STEM experts. Educational researchers indicate that teachers struggle to make connections across the STEM disciplines. Consequently, students are often disinterested in science and math when they learn in an isolated and disjoined manner missing connections to crosscutting concepts and real-world applications." The aim of their article is to "operationalize STEM education key concepts and blend learning theories to build an integrated STEM education framework to assist in further researching integrated STEM education framework" (2016). The authors describe one example: "Teachers and Researchers Advancing Integrated Lessons in STEM (TRAILS)" (2016) (Smyrnova-Trybulska, Morze, Kommers, Zuziak, & Gladun, 2016).

Methodological Bases and Content of the E-learning Course

The development of the authors' programme "Matematyka z Moodle" ["Mathematics with Moodle"] is based on the ADDIE model, whose name is an acronym for the English words: analysis, design, development, implementation, and

evaluation (Clark & Mayer, 2002). The ADDIE model consists of the analysis phase, the assumptions and conditions, the course design, the course development component, implementation, and evaluation. Constructing a good e-course, which runs under the ADDIE model, is an ongoing process. After the evaluation stage, there is the next stage of analysis, which starts the next phase of work on the course, and which is aimed at creation of a bug-free, efficient, and user friendly product.

Analysis

The training goals and expected results of our proposed system were defined (Heba, 2014). Then, surveys intended for 500 students and 500 teachers in secondary schools were performed. The detailed results are described in Heba (2010). Based on them, the computer software was designed. It was designed to support:
- teaching mathematics as well as technology connected with e-learning, and
- extending knowledge and mathematical skills that were selected.

An analysis of mathematical competence of secondary school pupils in Poland was done. The results are presented in Heba (2014). Math tasks for the e-learning course were chosen according to Niemierko's taxonomy of educational goals: A, B, C, and D (Niemierko, 1999).

Design

The system contains the description of objectives and tasks for mastering mathematical competence for secondary schools in the examination requirement standards. The schedule, organisational structure, duration, and pace of the proposed learning system were outlined.

The acting subject asks questions about effectiveness of own practice, observes own actions, assigns a specific meaning to them, makes own conclusions, which become the source of initiatives, and their effects generate next questions and ideas addressed to the action. This strategy has all signs of a "never-ending story" with participation of the researcher of own practice in the leading role. It is illustrated by the figures below, containing the charts of the procedure of action research. The results of cognition and action are noticed and assessed in their course, but are also confronted with the processes and structures in the wide context, in which the social and educational practice runs. Therefore, it may be stated that this procedure of disclosure of mechanisms governing the functioning of persons and communities is a specific type of *learning through experiencing* (Czerepaniak-Walczak, 2010, p. 231).

It should be emphasised that the models of the process of research on action – despite differences between each other in details – have some common features, namely: sequencing of thinking and acting, and cyclicality of sequences, that is, the steps of the action in every element and of the elements in the process. In fact, each of these models is a detailed model of the process prepared by Kurt Lewin (Czerepaniak-Walczak, 2010).

"The three stages of the change process determined by Kurt Lewin (unfreeze–change–freeze) consist of the following phases:

- facing an unknown problem or difficulty, which raises dissatisfaction of the person or of the group, and, as a result, produces a need for a change of project – realisation of the problem (unfreeze);
- implementation of the project, diagnosing the changed situation, checking the effects of new behaviours and actions, application of new measures, organisational changes, etc. (action–change); and
- evaluation of change implementation; if the evaluation results are satisfactory, they are introduced into practice on a permanent basis (freeze), and if they generate new problems, not known so far, new projects are formulated (new unfreeze); therefore, a new cycle of action and research starts.

Such a structure of the process of action research illustrates its cyclicality. The first element in the cycle is planning the application of the change factors. These factors may be: actions of the persons engaged in the process of teaching, educating, and learning; the used didactic measures; management of the space in which the educational interactions take place; the forms of time organisation, etc." (Czerepaniak-Walczak, 2010, p. 327).

The integrated process of cognition and transformation of own practice is called – apart from action research – "methodological research," "practice-based research," "practice-oriented research," or "participating research." Each of these names contains information that it is a cognitive procedure used for improvement of own practice in interaction with a reflection on it through a disclosure of the mechanisms governing it and its personal interpretation. It allows for dealing with a specific practical problem experienced in a natural situation. It is a combination of a research critical and constructive strategy with an empirical and analytical strategy.

This procedure originates from the Cartesian coup, reversing the order of contemplation and action in the process of knowledge creation. According to Hannah Arendt (2000, p. 314), the certainty of knowledge could have been obtained only after fulfilling two conditions: "firstly, that the knowledge relates to something done on one's own [...], and secondly, that this knowledge – due to its nature – can be checked solely through further doing of something" (Czerepaniak-Walczak, 2010, p. 322).

Knowledge creation has become an element of the process of transformation of reality. In this situation, both the knowledge of the subject on the object and the object itself are subject to a change. Human action has acquired a new dimension. It has become the object of cognition but also its driving force, while the knowing subject has become the cognised object for themselves as well as the author of the change in the cognition object. The examples of such an approach to complementarity of cognition and action, learning and knowledge expansion are found in philosophy, psychology, and pedagogy of John Dewey, who – apart

from Lewin – is considered to be the precursor of action research (Czerepaniak-Walczak, 2010).

The charts and diagrams representing the manner of training content were developed. A prototype lesson in the e-learning course with the application of the *MatLearn* module was created, and it was tested in the experimental group in order to verify the hypothesis of a potential increase of mathematical competence in a particular topic. The methods of and conditions for assessing were specified. Methods of system evaluation and collecting data for analysis and the reporting were established.

An analysis of objectives, scope of teaching, and activities of a teacher in the course is followed by the formation of the educational content in the e-learning environment. It is assumed that the programme corresponds to mathematics in terms of a subject matter and is constructed according to the following rules:
- introduction: educational objectives, abstracts, contents, references, definitions of terms, a forum, a registration questionnaire;
- thematic modules: a pre-test (diagnostic test), study materials, a block of tasks, verification and control of information, creative tasks, interactive communication – a teacher with students and among students; and
- summary: an exam test, a final questionnaire.
  Our "Matematyka z Moodle" system contains:
- documents: a new core curriculum in mathematics, Polish educational programme *Matematyka z plusem*, a guide for graduation examination by the Central Examination Board;
- an e-learning course preparing for the graduation exam in mathematics with the authors' *MatLearn* module; and
- a user manual for the students.

After evaluating the system, necessary adjustments were done, and a methodological guide for the teachers is being prepared. It will include numerous scenarios of mathematics lessons with the use of our e-learning course "Matematyka z Moodle."

A course preparing for the graduation exam contains the following parts:
- introduction to the course;
- eight e-learning units, each of which will contain a maximum of five lessons;
- sets of tasks for the graduation exams from previous years; and
- end of the course.

The e-learning course contains a module forming mathematical competence. The module is controlled by the *if–then–else* condition. It verifies whether the condition placed after *if* is fulfilled. If it is, the block of instructions following *then* is realised. If this condition is not fulfilled, the block of instructions following *else* is realised.

Development

The final product – the e-learning course is developed. Study materials, tasks, *GeoGebra* applets, and tests are prepared. The *MatLearn* module is based on a number of theoretical resources (Bertrand, 1998): behaviourism (Skinner, 1974), constructivism (Piaget, 1977, 1985; Weicker, 2005), as well as Niemierko's taxonomy of educational objectives (Hudecová, 2003; Niemierko, 1999) and Skinner's programmed learning elements as described in the work by Kapounová and Pavlíček (2003):

- the principle of small steps;
- the principle of active response;
- the principle of immediate confirmation;
- the principle of self-pacing; and
- the principle of self-evaluation.

Nowadays, computers at school may be used as teaching machines for the realisation of programmed learning in combination with hypertext and multimedia in e-learning.

Implementation

Study materials are stored on the Moodle platform, and information on how to operate the course is given to students and teachers in the form of specific training sessions. An administrator assists with technical problems, and the teachers help the students with their problems in mathematics. The training/experiment is managed according to a schedule planned in the design stage. During the pilot stage, the functionality of the *MatLearn* module was tested and contents of Niemierko's categories, mathematics tasks, timings of tests, and understanding of tasks were verified.

Evaluation

At the final stage the operation, form and content of the course was evaluated. The formal evaluation of the e-learning course follows mainly Kirkpatrick and Kirkpatrick's model of training effectiveness (J. Kirkpatrick & K. W. Kirkpatrick, 2009).

Teaching Mathematics Using *GeoGebra*

Escuder and Furner (2012) note: "The most powerful feature of *GeoGebra* is the connection it makes between Geometry, Algebra, Calculus, and Statistics. *GeoGebra* is a dynamic geometry system in which you work with points, vectors, segments, lines, and conic sections. *GeoGebra* is also a dynamic algebraic system,

where equations and coordinates can be entered directly. Functions can be defined algebraically and then changed dynamically afterwards. *GeoGebra* has a simple CAS in the background, which has the ability to deal with variables for numbers, vectors and points, find derivatives and integrals of functions and offers commands like Root or Extremum" (pp. 77–78). As the authors stress further, "These two views are characteristic of *GeoGebra*: an expression in the algebra window corresponds to an object in the geometry window and vice versa. The spreadsheet view has been added recently making it possible to enter data in the spreadsheet and view graphs in the geometry window while maintaining its dynamic characteristic. Although *GeoGebra* has been primarily intended for mathematics instruction in secondary schools, it certainly has uses in Higher Education and even now being brought down to the elementary levels as well" (Escuder & Furner, 2012, pp. 77–78). Figure 1 shows the example of the *GeoGebra* Applets.
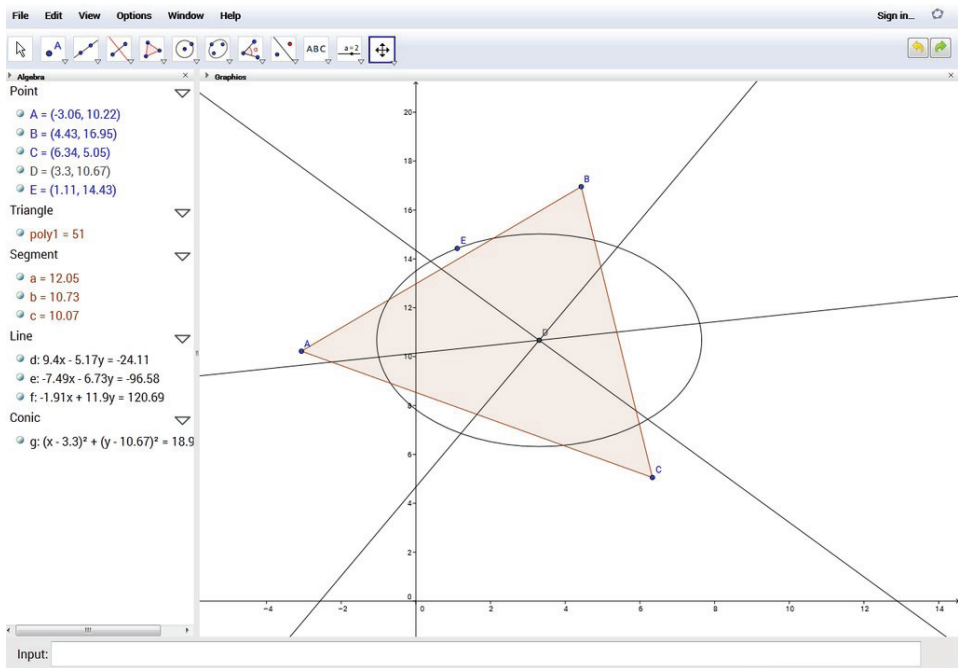

Figure 1. GeoGebra Applets.

S o u r c e: CopyScreen of the example in GeoGebra Applets.

Teaching Mathematics Using an E-learning Course

Teaching with the use of the platform is carried out in accordance with a predetermined schedule and a scheme of the e-learning course. At the beginning, a student analyses papers concerning the school-leaving exam, which can be found on the platform's main page. Afterwards, one proceeds to the actual course, fills out a public questionnaire, and then is redirected to other parts which can be found in the introductory part of the course: operating instructions concerning the platform and course, literature, information on the computer programmes used during the teaching. Next, one is redirected to the introductory test – a pre-test consisting of 30 closed school-leaving exam tasks. A student continues to the next part regardless of his or her test results. After one finishes the pre-test, the system redirects one to the individual e-learning units. Each unit consists of a maximum of 5 classes.

Each class is a multimedia programme which consists of 4 modules at 4 levels of the categories of taxonomic aims by Niemierko (A, B, C, D), and of the course structure, which consists of the following:
 • knowledge (of the course contents);
 • e-tasks (exercises, tasks with the use of the *GeoGebra* programme);
 • Test I, Test II, Test III (parts that determine the level of mastering of the learned skills), which are a part of the e-tasks; and
 • a help-teacher module.

All the information, instructions, and directions are forwarded in a written form. Within the course, a student moves by using hypertext or a button, which can be preset in the Moodle system.

The first part of each class determines its objectives, introductory requirements, and problematic issues that will be solved. The knowledge is passed in an interactive manner. The individual modules are divided into screens on which students – through the tasks – acquire knowledge and learn to form mathematical competencies. They can also use the *GeoGebra* programme.

The second part of the e-tasks consists of tasks which consolidate and form the acquired knowledge and skills. Each task contains samples of solution, some of which come with the *GeoGebra* applets. After a student completes this part (at each level), he or she proceeds to the third part.

The third part of the class is the module of tests (Test I, Test II, and Test III). The tests provide both students and teachers with feedback on students' ability to master knowledge and skills at a particular level of a particular curriculum. In this part, a student can no longer use the help or return to the already solved tasks.

At the end, there is a help-teacher module, which makes it possible for a student to become acquainted (on his or her own, or with a teacher's help) with the solution of each level's test, to compare it with his or her own solution, and to consolidate the knowledge and skills in the tasks that he or she solved incorrectly.

At the conclusion of the e-learning unit, a student solves homework – a set of open tasks which is evaluated by a teacher and sent back to a student (and thus providing feedback) via the Moodle system.

Students' working with the e-learning units is being evaluated all the time. Thanks to automatically generated reports, a teacher has a permanent access to information on how his or her students have dealt with individual mathematical competencies.

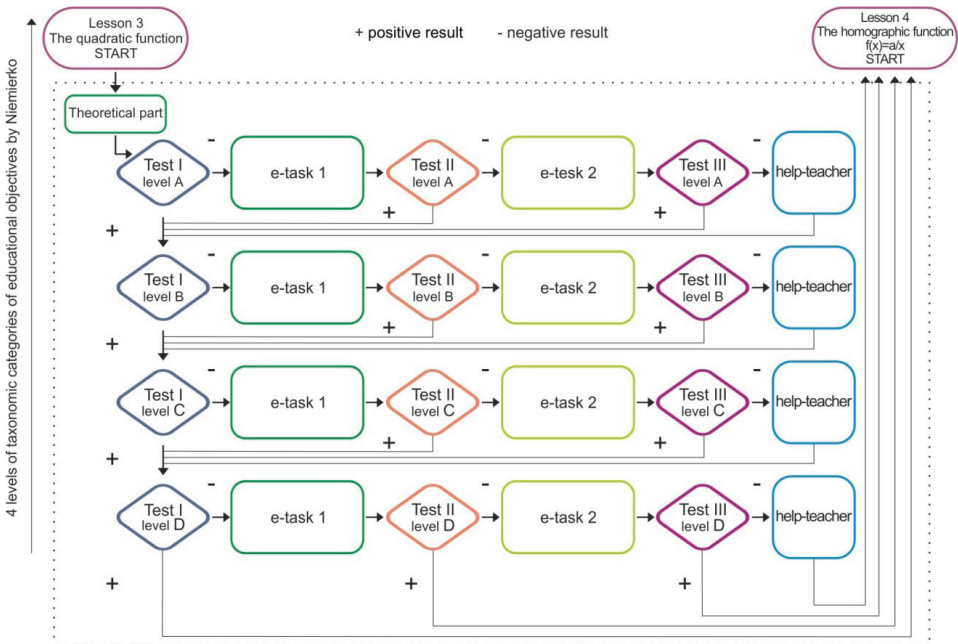*Figure 2.* The structure of the *MatLearn* module.

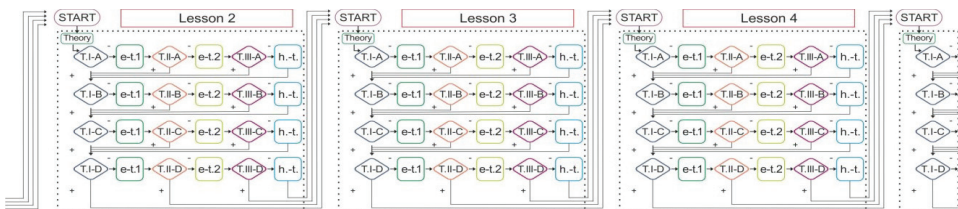S o u r c e: Heba, Kapounova, & Smyrnova-Trybulska, 2014b.

Figure 3. The structure of the e-learning units.

S o u r c e: Heba, 2014.

Teachers can use parts of the course in regular mathematics classes and also in tutoring classes. In the course, students can work independently at home and can choose their own pace, time, and environment for studying.

The development of students' mathematical competencies is measured twice: by a pre-test taken before the start of the course and by a test taken at the end of the course. The aim of it is the evaluation of the studying progress of the students who are preparing for their school-leaving exam. Before the start of the course, a student tries to solve 5 sets of school-leaving exam tasks from previous years. To compare their results, a student uses the help-teacher module, which will offer him or her correct results.

Conclusion

The mathematics authorial course, which contains elements of programmed learning, was proposed and tested. It is based on Niemierko's taxonomy of educational aims and works on the principle based on the gradual increasing of the difficulty level of the solved tasks. The proposed system is realised as a Moodle platform e-learning course. It was tested for three areas of mathematics: functions and their qualities, analytic geometry, and planimetry and stereometry. The mathematical experiment – which took place in the experimental and control groups – proved that students who used the "Matematyka z Moodle" system for their preparation for the school-leaving exam improved their competencies in the taught areas of mathematics. More information about it can be found in Heba, Kapounova, and Smyrnova-Trybulska (2014a, 2014b, 2014c).

Conclusions obtained in the course of pedagogical experiment have brought concepts of further development. The plans are:
- completing a methodological guide for teachers after evaluating the proposed learning system by mathematics and ICT examiners, and an examiner from the Central Examination Board;
- conducting long-term studies of a complete e-learning course (8 thematic modules) at upper secondary school in a larger group of students from several voivodships;
- developing a system for individual mathematics instructional systems – "Moodle Math" – throughout the core and extended learning cycles;
- conducting an analysis of the learning path of the pupil on the Moodle platform;
- adapting the MatLearn course to video conferencing capabilities (Skype, Clickmeeting, etc.);
- adapting the MatLearn course to mobile applications;
- adapting the MatLearn course to other free platforms such as eFront used in Polish schools;
- adapting the projected system to other subjects in Polish post-gymnasium schools; and

- conducting similar studies for other subjects and other types of post-gymna-siums.

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Agnieszka Heba, Eugenia Smyrnova-Trybulska, Jana Kapounová

Cele i zawartość matematycznego kursu e-learningowego przygotowującego uczniów do egzaminu maturalnego z matematyki

S t r e s z c z e n i e

Technologie informatyczne (technologie ICT) mogą pomóc w rozwiązaniu problemu związanego z kształtowaniem kompetencji matematycznych u uczniów i są wykorzystywane w procesie nauczania matematyki. Pierwsza część niniejszego artykułu przedstawia teoretyczne tło tej tematyki, m.in. opis kompetencji matematycznych i ich identyfikację w szkole ponadgimnazjalnej w Polsce, taksonomię Niemierki, teorię nauczania programowanego i strukturę systemu edukacji/nauczania w środowisku e-learningowym. Określa ona warunki wstępne, oczekiwane wyniki, koncepcje, cele, hipotezy i metody badawcze. Część praktyczna opisuje strukturę systemu nauczania indywidualnego, „Matematykę z Moodle", opartą na autorskim module *MatLearn*, oraz jego formę graficzną. Zaproponowane zostało narzędzie dydaktyczne – kurs e-learningowy przygotowujący uczniów do egzaminu maturalnego z matematyki i podnoszący kompetencje matematyczne uczniów. Jego celem jest podwyższenie poziomu kompetencji, w szczególności tych, które nie zostały jeszcze opanowane. W celu zbudowania czynności edukacyjnych w ramach kursu wykorzystano zasady nauczania programowanego i taksonomię Niemierki.

S ł o w a   k l u c z o w e: technologie teleinformatyczne (ICT), kluczowe kompetencje, kompetencje matematyczne, e-learning, taksonomia Niemierki, programowane nauczanie, moduł MatLearn, Matematyka z Moodle

Agnieszka Heba, Eugenia Smyrnova-Trybulska, Jana Kapounová

Цели и содержание электронного учебного курса Математика для подготовки учащихся к выпускным экзаменам по математике в школе

А н о т а ц и я

Информационные и коммуникационные технологии (ИКТ) могут помочь решить проблемы в процессе обучения математике. Первая часть статьи представляет теоретические основы, в частности: описание математических компетенций и их идентификацию в старшей школе в Польше, таксономию Немерко, теорию программированного обучения и структуру системы образования / обучения в электронной среде обучения. Описаны предпосылки, ожидаемые результаты, концепции, цели, гипотезы и методы исследования. Практическая часть описывает структуру системы для индивидуального обучения математики с Moodle на основе оригинального авторского модуля MatLearn и его графическое представление. Был предложен дидактический инструмент - электронный курс подготовки учащихся к выпускным экзаменам по математике и совершенствование математических компетенций. Его цель состоит в том, чтобы повысить уровень компетенций, особенно тех, которые еще не были освоены. Для построения исследовательской деятельности в процессе, были использованы запрограммированные принципы обучения и таксономия Немерко.

К л ю ч е в ы е с л о в а: информационные и коммуникационные технологии (ИКТ), ключевые компетенции, математические компетенции, электронное обучение, таксономия Немерко, программированное обучение, модуль MatLearn, Математика с Moodle

Agnieszka Heba, Eugenia Smyrnova-Trybulska, Jana Kapounová

Objetivos y contenido del curso e-learning de matemáticas de preparación de los estudiantes para el examen final de la escuela de matemáticas

R e s u m e n

Las tecnologías de la información y la comunicación (TIC) pueden ayudar a resolver problemas y por ello se utilizan en el proceso de enseñanza de las matemáticas. La primera parte del trabajo presenta los antecedentes teóricos de estos aspectos, entre otros: la descripción de las competencias matemáticas y su identificación en la escuela superior de Polonia, la taxonomía de Niemierko, la teoría del aprendizaje programado y la estructura del sistema de educación / aprendizaje en entornos de e-learning. Expresa las condiciones previas, resultados esperados, conceptos, objetivos, hipótesis y métodos de investigación. La parte práctica describe la estructura del sistema para el aprendizaje individual de las matemáticas en Moodle basado en el módulo MatLearn original del propio autor y su representación gráfica. Se propone una herramienta didáctica - un curso e-learning de preparación de los estudiantes para el examen de graduación de matemáticas y de mejora de las competencias matemáticas de los estudiantes. Su objetivo es aumentar el nivel en las competencias, especialmente en aquellas que aún no han sido dominadas. Para elaborar las actividades de estudio del curso, se han utilizado los principios de aprendizaje programado y la taxonomía de Niemierko.

P a l a b r a s c l a v e: tecnologías de la información y la comunicación (TIC), competencias clave, competencias matemáticas, e-learning, taxonomía de Niemierko, aprendizaje programado, módulo MatLearn, matemáticas con Moodle

IV

Reports

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Report on the Implementation of Work Package 5 "Pilot Methodology Development" in the Framework of the IRNet Project

Abstract

This article, prepared by an international team of researchers from different scientific areas connected with ICT, e-learning, pedagogy, and other related disciplines, focuses on the objectives and some results of the international project IRNet. In particular, the article describes research tools, methods, and a procedure of the Work Package 5 (WP5), that is, objectives, tasks, deliverables, and implementation of research trips in the context of the next stages and Work Packages of IRNet project – International Research Network.

K e y w o r d s: International Research Network IRNet, ICT, e-learning, intercultural competencies, methodology

Introduction

The objectives of the Work Package 5 (WP5) are: to develop, to theoretically justify, and to experimentally verify the basic concept of shaping the location of ICT teachers' competencies in the use of information and communication technologies and remote forms of teaching in their professional activities, as well as the basic components of a computer-oriented system of methical preparation of contemporary specialists (in particularly future and active teachers) to use ICT and distance forms of teaching in the educational process and intercultural competencies. To specify, the aims are to develop the content, forms, methods, technologies, but also to define and to test a computer-oriented methical and theoretical scientific system for development of competencies.

Description of Activities

The content, forms, methods, and technologies have been developed. A computer-oriented methical and theoretical scientific system for competencies development has been defined and tested. It includes:
- psychological and pedagogical aspects;
- organisational and methical security curriculum;
- implementation of the social contract in such educational requirements for training future and in-service teachers;
- protection of the learning process of computerisation measures;
- information, methodological, and technical support of the school and the cognitive activity of in-service and future teachers and other specialists with extensive use of distance forms of learning, based on Internet technologies; and
- adequate information on competencies components including e-learning and intercultural competencies.

Teaching and learning methodology and knowledge transfer process have been subjects of a series of debates. General aspects and details of the methodological approach have been discussed.

Main Topics and Objectives
Main topics are:
- general environment of theories and methodologies of online teaching and learning,
- self-learning approaches and techniques, and
- learning styles and teaching process.

Objectives and teaching taxonomies are:
- teaching methods,
- face-to-face pedagogical techniques versus distance techniques,
- teaching models,
- pedagogic management of the project,
- planning and coordination of courses,
- personal and institutional ICT plans,
- methodology and techniques of e-learning,
- methodology of producing e-content, and
- evaluation of the teacher's skills necessary to work in an ICT environment.

IRNet researchers conducted analyses of some methodological aspects of developing MOOCs, such as microlearning, subscription learning, peer assessment as well as presenting and analysing the research outcomes, research results of a survey conducted among students of several countries within the framework of the European Union project IRNet (www.irnet.us.edu.pl), limitations and future research. A draft version of the MOOC "ICT-tools in e-learning" (http://el.us.edu.pl/irnet) was elaborated. It includes 10 topics: e-learning in higher education; ICT tools for presentation of multimedia content and tools for making didactic videos; tools for adaptive learning, learning styles; tools for mind maps and infographics knowledge; gamification in education; ICT tools for collaboration; tools for formative assessment and control; Digital Storytelling; ICT tools for developing intercultural competences; and social presence in online tutoring.

Tasks

Task 5.1. Defining some most important skills of the contemporary specialist course profile.

Some most important skills of the contemporary specialist course profile were identified and published in:

1) Nagiyova, I. (2016). Constructivism in teaching of basic computer skills. In K. Kostolányova (Ed.), Proceedings from *Information and Communication Technology in Education (ICTE-2016), 17th Annual Conference* (pp. 124–132). Ostrava: University of Ostrava. Retrieved from https://konference.osu.cz/icte/dokumenty/2016/proceedings ICTE2016.pdf.

2) Noskova, T., Pavlova, T., & Yakovleva, O. (2016). Social media: New educational practices and competences. In Proceedings from *Applied Linguistics in Science and Education*, 24–26 November 2016 (pp. 310–315). Saint-Petersburg: HSPU.

3) Smyrnova-Trybulska, E. (Ed.). (2016). *E-learning methodology – Implementation and evaluation*, Scientific Monograph, Vol. 8. Katowice-Cieszyn: Studio Noa for University of Silesia.

Task 5.2. Identification and theoretical justification of the principles, forms, and methods of the effective use of the ICT and remote forms of teaching in the education in higher pedagogical educational institutions.

The theoretical justification of the principles, forms, and methods of the effective use of the ICT and remote forms of teaching in the education in higher pedagogical educational institutions has been identified and published in a series of articles and books:

1) Turčáni, M., Balogh, Z., Munk, M., & Benko, Ľ. (Eds.). (2016). Proceedings from *DIVAI 2016 – Distance Learning in Applied Informatics. 11th International Scientific Conference on Distance Learning in Applied Informatics*, 2–4 May 2016. Constantine the Philosopher University in Nitra, Faculty of Natural Sciences, Department of Informatics. Nitra: Wolters Kluwer.

2) Smyrnova-Trybulska, E. (Ed.). (2016). *E-learning methodology – Implementation and evaluation*, Scientific Monograph, Vol. 8. Katowice-Cieszyn: Studio Noa for University of Silesia.

3) Morze, N. (2016). Open educational e-environment of modern university. Introduction. In N. Morze (Ed.), *Open educational e-environment of modern university (2)* (pp. 7–10). Kiev: Borys Grinchenko Kiev University. Retrieved from http://openedu.kubg.edu.ua/journal/index.php/openedu/issue/view/2/showToc#.V-y1IDUudZc.

4) Morze, N. & Vorotnikova, I. (2016). Модель ІКТ компетентності вчителів. *Journal ScienceRise: Pedagogical Education*, *10*(6), 4–9.

Aims of the practical implementation of WP5 have been elaborated:

• development verified in empirical research of the e-learning course MOOC "ICT-tools for e-learning," the improving efficiency of the educational process-oriented development of ICT and e-learning competencies, and other components of the system such as content, means, methods, forms of teaching, and so on;

• development of the curriculum of an MA course, the international specialisation and start in the frame of the Erasmus Mundus programme.

Differentiation of the aims:

1.1. Global (general) aims

1.2. Detail (specific) aims

Planned development of:

2.1. Knowledge

2.2. Skills

2.3. Social competencies

Planned development of competencies of the 21st century:

3.1. Specific competencies

3.2. Key competencies

3.3. Soft competencies

There has been elaborated a draft learning system conception. The content includes:

1) MOOC "ICT-tools for e-learning" (10 modules) – two versions:
- 1st level, core version (videos, tests);
- 2nd level, advanced version, full course (includes: videos, tests, forum, tasks, projects, other activities).
2) MA course "E-learning in cultural diversity" (curriculum).
   Additional contents are:
- postgraduate studies;
- teacher training courses;
- international and native distance learning courses; and
- monographs, scripts, publications, other.

Task 5.3. Development of a computer-oriented methodological and theoretical scientific system for training contemporary specialists.

A computer-oriented methodological and theoretical scientific system for training contemporary specialists has been developed and published in:

1) Smyrnova-Trybulska, E. (Ed.). (2016). *E-learning methodology – Implementation and evaluation*, Scientific Monograph, Vol. 8. Katowice-Cieszyn: Studio Noa for University of Silesia.
2) Morze, N. (Ed.). (2016). *Open educational e-environment of modern university (2).* Kiev: Borys Grinchenko Kiev University. Retrieved from http://openedu. kubg.edu.ua/journal/index.php/openedu/issue/view/2/showToc#.V-y1IDUu dZc.
3) Kostolányova, K. (Ed.). (2016). Proceedings from *Information and Communication Technology in Education (ICTE-2016), 17th Annual Conference*. Ostrava: University of Ostrava. Retrieved from https://konference.osu.cz/icte/dokumen ty/2016/proceedings ICTE2016.pdf.
4) Turčáni, M., Balogh, Z., Munk, M., & Benko, Ľ. (Eds.). (2016). Proceedings from *DIVAI 2016 – Distance Learning in Applied Informatics. 11th International Scientific Conference on Distance Learning in Applied Informatics*, 2–4 May 2016. Constantine the Philosopher University in Nitra, Faculty of Natural Sciences, Department of Informatics. Nitra: Wolters Kluwer.

For more information, see the *Theoretical and Methodological Bases* section.

Task 5.4. Development of theoretical-methodological, psychological, pedagogical, and methodological foundations of distance learning science based on Internet technologies.

The theoretical-methodological, psychological, pedagogical, and methodological foundations of distance learning science based on Internet technologies have been developed and published in:

1) Smyrnova-Trybulska, E. (Ed.). (2016). *E-learning methodology – Implementation and evaluation*, Scientific Monograph, Vol. 8. Katowice-Cieszyn: Studio Noa for University of Silesia.

2) Morze, N. (Ed.). (2016). *Open educational e-environment of modern university (2).* Kiev: Borys Grinchenko Kiev University. Retrieved from http://openedu.kubg.edu.ua/journal/index.php/openedu/issue/view/2/showToc#.V-y1IDUudZc.

3) Kostolányova, K. (Ed.). (2016). Proceedings from *Information and Communication Technology in Education (ICTE-2016), 17th Annual Conference.* Ostrava: University of Ostrava. Retrieved from https://konference.osu.cz/icte/dokumenty/2016/proceedings ICTE2016.pdf.

4) Turčáni, M., Balogh, Z., Munk, M., & Benko, Ľ. (Eds.). (2016). Proceedings from *DIVAI 2016 – Distance Learning in Applied Informatics. 11th International Scientific Conference on Distance Learning in Applied Informatics*, 2–4 May 2016. Constantine the Philosopher University in Nitra, Faculty of Natural Sciences, Department of Informatics. Nitra: Wolters Kluwer.

Task 5.5. Dissemination of the research results: lectures, seminars, other activities.

During the implementation of WP5 more than 100 lectures and presentations have been organised, conducted, and presented. Presentations of IRNet researchers with description are attached in Annex 2 and uploaded to Participants Portal EC with the main project periodical report. All information about the dissemination is available on the project's website (www.irnet.us.edu.pl, http://www.irnet.us.edu.pl/dissemination) and on Facebook (https://www.facebook.com/IRNet-1669593856645370/).

Task 5.6. Project events: conferences, workshops, and roundtables.

During the implementation of WP5 more than 50 project events have been organised and realised: 7 international scientific conferences, more than 25 workshops and seminars, more than 20 roundtable debates, and other activities. The presentation of IRNet researchers description is attached in Annex 2 and uploaded to Participants Portal EC with the main project periodical report.

Task 5.7. Account identifying and characterising organisational forms, models, distance learning and remote types of courses, case-technologies, social media, Web 2.0 and Web 3.0. Massive Open Online Courses, virtual classroom, Internet-courses and selected IT tools tested during WP4, such as LMS (Learning Management Systems), CMS (Contents Management Systems), VSCR (Virtual Synchronous Classrooms), SSA (Screen Share Applications), CSA (Contents Sharing Application), cloud computing environment, virtual campus, and virtual learning environment.

1) Delicado Puerto, G., Arias Masa, J., Alonso Díaz, L., Yuste Tosina, R., Gutiérrez Esteban, P., & Cubo Delgado, S. (2016). Synchronous Virtual Classrooms in problem-based learning to mentor and monitor students in higher education. In *New Educational Strategies in Modern Information Space. E-learning Methodology Proceedings* (Scientific papers) (pp.10–14). Saint-Petersburg: HSPU.

2) Cápay, M., Drlík, M., Švec, P., Tomanová, J., Romaniukha, M., & Sorokina, L. (2016). Attitudes and expectations on virtual environments of the universities. In M. Turčáni, Z. Balogh, M. Munk, & Ľ. Benko, (Eds.), Proceedings from *DIVAI 2016 – Distance Learning in Applied Informatics. 11*th *International Scientific Conference on Distance Learning in Applied Informatics*, 2–4 May 2016 (pp. 273–285). Constantine the Philosopher University in Nitra, Faculty of Natural Sciences, Department of Informatics. Nitra: Wolters Kluwer.

3) Buinytska, O. (2016). E-education content management. In E. Smyrnova-Trybulska, (Ed.), *E-learning methodology – Implementation and evaluation*, Scientific Monograph, Vol. 8 (pp. 451–466). Katowice-Cieszyn: Studio Noa for University of Silesia.

4) Smyrnova-Trybulska, E. (Ed.). (2016). *E-learning methodology – Implementation and evaluation*, Scientific Monograph, Vol. 8. Katowice-Cieszyn: Studio Noa for University of Silesia.

Task 5.8. *Pedagogical and Technological Aspects Using Virtual Classrooms –* videoconference conducted by UEx (Spain).

A videoconference *Pedagogical and Technological Aspects Using Virtual Classrooms* was organised and conducted by prof. Laura Alonso and prof. Prudencia Esteban from UEx (Spain) in September 2016 with the participation of IRNet researchers from Spain, Russia, Poland, Portugal, Ukraine, Slovakia, Australia, and the Netherlands in presence and remote mode via Adobe Connect (virtual room URL address: http://uex.adobeconnect.com/irnet).

Task 5.9. Workshop and e-round table debate in LU (Portugal).

On 2 February 2016, an international scientific seminar, workshop, and e-round table debate, *Preparing to be a blended teacher in the 21*st *century*, took place in Lusiada Lisbone University, Portugal with the participation of near 35 participants from different countries, in particular researchers from Poland, Spain, Ukraine, Russia, and Portugal.

Task 5.10. Meeting and workshop in UT (the Netherlands).

The meeting was held on 23 November 2017 at the Curtin University. Prof. Piet Kommers from UT, NL conducted a seminar and workshop on MOOCs in education. Additionally, a round table debate was held with the participation of researchers from UT, NL, US, PL, OU, CZ, CU, and AU at the Curtin University, AU.

Task 5.11. *E-learning Methodology* conference and workshop in HSPU (Russia).

On 13 April 2016, an international scientific conference *New Educational Strategies in the Contemporary Information Environment: E-learning Methodology* took place, organised by HSPU, SPB, Russia. There were more than 40 participants from different countries (Spain, Poland, Russia, Slovakia, Australia, and other). Participation in plenary sessions, thematic conference sessions, and round table debates was possible. As a result, a book was published: *New Educational Strategies in Modern Information Space. E-Learning Methodology Proceedings* (Scientific papers). (2016). Saint-Petersburg: HSPU. The book included the best articles,

elaborated by conference participants, in particular 4 IRNet papers with some project results (more details in Annex 1 "IRNet Publications" at Participants Portal EC).

Task 5.12. *DIVAI 2016* conference, UKF (Slovakia).

On 2–4 May 2016, there was an international scientific conference *DIVAI 2016* (*Distance Learning in Applied Informatics*) in UKF (Slovakia) with the participation of more than 80 participants from different countries. A book was published: Turčáni, M., Balogh, Z., Munk, M., & Benko, Ľ. (Eds.). (2016). Proceedings from *DIVAI 2016 – Distance Learning in Applied Informatics. 11th International Scientific Conference on Distance Learning in Applied Informatics*, 2–4 May 2016. Constantine the Philosopher University in Nitra, Faculty of Natural Sciences, Department of Informatics. Nitra: Wolters Kluwer. It included the best articles, elaborated by conference participants, in particular 5 IRNet papers with project results (more details in Annex 1 "IRNet Publications" at Participants Portal EC).

Task 5.13. *The skills of scientific communication among faculty using repositories, wiki technology, e-libraries* conference, DSTU (BGKU) (Ukraine).

On 9 September 2016 – *Open Educational E-environment of the Modern University (The skills of scientific communication among faculty using repositories, wiki technology, e-libraries)* (http://openedu.kubg.edu.ua/) was held at the Borys Grinchenko Kyiv University (BGKU) (Ukraine). Conference objectives were: trends and strategies of the open educational resources development, formation of the university's open educational e-environment as a factor of increasing the quality of education, problems and prospects of interaction of the subjects in the open educational environment in the process of professional training, blended and distance learning as a way of access to quality education, and lifelong learning – the process and the motivation to use open educational resources. A book was published: Morze, N. (Ed.). (2016). *Open educational e-environment of modern university (2)*. Kiev: Borys Grinchenko Kiev University. Retrieved from http://openedu.kubg.edu.ua/journal/index.php/openedu/issue/view/2/showToc#.V-y1IDUudZc. It includes the best articles, elaborated by conference participants, in particular 10 IRNet papers with project results (more details in Annex 1 "IRNet Publications").

Deliverables

During the period, a number of deliverables were achieved for the WP5.

D 5.1. Month 28 – *E-learning methodology* – scientific monograph; *New Educational Strategies in Modern Information Space. E-Learning Methodology Proceedings* (Scientific papers) (HSPU and all researchers).

D 5.2. Month 29 – Publications in *DIVAI 2016 – Distance Learning in Applied Informatics. 11th International Scientific Conference on Distance Learning in Applied Informatics* Conference Proceedings (UKF, Slovakia).

D 5.3. Month 31 – Elaboration of new methods of research and diagnostics.

As a product of modern telecommunication technology-based systems, e-learning turns out to be an efficient tool for bridging the distance gap on the Internet. In fact, e-learning is not a remote learning tool; it is a tool for overcoming the distance gap as such. That is why distance learning and e-learning are not to be included into one category. The distance gap is completely bridged for the parties involved in an e-learning session within the framework of instructors-to-students and students-to-students interactions. If a rationalised approach to e-learning is used, reasonable managers of "state-of-the-art" universities do not use a traditional break-up scheme in their descriptions of learning modes (face-to-face and correspondence courses). They speak about various forms of integrated learning. This mode includes the face-to-face mode used in combination with modern ICT, and this is what transfers the learning process into the virtual reality.

Knowledge Management – both of data, information to gain knowledge, and then competence – Theory and Practice. WP5 groundwork methodological framework is the ADDIE model.

D 5.4. Month 31 – Developing pilot methodology of enhancing ICT and e-learning competencies, as well as intercultural awareness by means of Internet technologies: LCMS systems (Moodle), Massive Open Online Courses, virtual classroom technology, social media, other selected Web 2.0 and Web 3.0. Technology, and other technologies.

A pilot questionnaire was derived and implemented for the diagnostics of the open course means most efficient to cater to the e-learning expectations of consortium universities. Some results have been published in:

1) Smyrnova-Trybulska, E., Ogrodzka-Mazur, E., Szafrańska-Gajdzica, A., Morze, N., Makhachashvili, R., Noskova, T., Pavlova, T., Yakovleva, O., Issa, Tomayess, & Issa, Theodora. (2016). MOOCs – Theoretical and practical aspects: Comparison of selected research results: Poland, Russia, Ukraine, and Australia. In P. Kommers, Tomayess Issa, Theodora Issa, E. McKay, & P. Isaías (Eds.), Proceedings from the *International Conferences on Internet Technologies & Society 2016* (ITS 2016), *Educational Technologies 2016* (ICEduTech 2016), and *Sustainability, Technology and Education 2016* (STE 2016), Melbourne, 6–8 December, 2016 (pp. 107–114). IADIS.

2) Smyrnova-Trybulska, E. (2016). Selected aspects of effective use of didactic videos and MOOCs in education. In *New Educational Strategies in Modern Information Space. E-Learning Methodology Proceedings* (Scientific papers) (pp. 15–26). Saint Petersburg: HSPU.

Based on the questionnaire results, a pilot methodology and roadmap of MOOC on ICTEL was derived:

- a sample MOOC description on "Collaboration and ICT instruments in blended learning environment" and
- ICT tools for e-learning and blended learning environment.

Massive open online courses (MOOC) are called the greatest revolution in education since the emergence of the printed book. Hundreds of leading universities create their own massive online courses, and the most popular MOOCs gather an audience of over 1 million listeners. Massive online courses as an extremely effective tool used to disseminate knowledge are used by the most authoritative international organisations such as the International Monetary Fund and Amnesty International, as well as leading global companies including Google and Microsoft.

Not only students need to master collaboration as the market demands of the professional the skills of teamwork, effective co-work. This course will help one understand all the nuances of the format features of cooperation in teaching students using ICT tools, understand whether one needs to study all existing ICT tools for cooperation and collaboration, and provide step by step instructions on how to use ICT tools in a quality online course on the possibility of further use in blended learning offered to students. IRNet researchers also consider the best evidence-based teaching practice and learn to integrate massive online courses in the educational process offline.

D 5.5. Month 32 – Pre-trip schedules and post-trip reports outlining the second-ments-related activities. Pre-trip schedules and post-trip reports outlining the secondments-related activities are presented in second part of this report.

D 5.6. Month 32 – *Pedagogical and technological aspects using Virtual Classrooms* – a publication in the scientific international journal IJWBC. Theses in VU2016.

The article *Pedagogical and technological aspects using Virtual Classrooms* has been prepared for publication in the *International Journal of Web Based Communities* (IJWBC) and submitted via an online system of Inderscience publishing house. Theses in VU2016 have been published as an article in the scientific journal: Smyrnova-Trybulska, E. & Morze, N. (2016). From programmed teaching to constructivism and personally-oriented approach to e-learning. *EduAkcja. Magazyn edukacji elektronicznej*, *2*(12), 15–28. The publication in the electronic scientific journal *EduAkcja* was conducted by the organisers of VU conference: OKNO, PTNEI, Warsaw University of Technology, Poland.

D 5.7. Month 32 – Interim reports.

Interim reports, which include most important research results of WP5, have been prepared and uploaded to RRR. The work was coordinated by prof. Nataliia Morze, BGKU team (Ukraine).

Milestones (Month 32)

The decision was made, after previous evaluation, on the implementation of the developed pilot methodology. IRNet researchers conducted analyses of some methodological aspects of developing MOOCs, such as microlearning, subscription learning, peer assessment as well as presenting and analysing the research outcomes, research results of a survey conducted among students of several countries within the framework of the European Union project IRNet (www.irnet.

us.edu.pl), limitations, and future research. A draft version of the MOOC "ICT-tools in e-learning" (http://el.us.edu.pl/irnet) was elaborated. It includes 10 topics: e-learning in higher education; ICT tools for presentation of multimedia content and tools for making didactic videos; tools for adaptive learning, learning styles; tools for mind maps and infographics knowledge; gamification in education; ICT tools for collaboration; tools for formative assessment and control; Digital Storytelling; ICT tools for developing intercultural competences; and social presence in online tutoring. The work on developing and improving MOOCs "ICT-tools in e-learning" was continued. Focus groups (approx. 10 students) from every partner country participated in this course; the results were comprehensively and deeply analysed. The surveys, filled by students and participants of the pilot version of the MOOC, confirmed generally a positive assessment of the course, stressed rich contents, a lot of videos and other multimedia materials, and contemporary topics. Simultaneously there are a number of suggestions, recommendations, proposals from side learners, such as adding subtitles in native languages and reducing the duration of videos to 10 minutes.

Reports were published on the Project website (www.irnet.us.edu.pl), in the conference proceedings, and in the scientific magazine approved by peer review. In addition the reportages about project activities and events were published on the social portals: https://www.facebook.com/IRNet-1669593856645370/ and https://twitter.com/irnet_project.

Transfer of Knowledge and Training Activities (Workshops)

The secondments provided the IRNet researchers with the opportunity to acquire new skills and experience, and learn about different working practices related to the development of new tools and methods of work in the field of ICT instruments, e-learning, and intercultural competencies, as well as to enable researchers to be more effective in the work in their own departments. In particular, the secondments provided the following support and knowledge to the project and future research opportunities:

- analysis of the methodological background and main approaches of conducting international investigations on ICT, e-learning, and intercultural competencies in order to work out a system of measuring instruments appropriate for the research at the international level;
- analysis and evaluation of the level of ICT, e-learning, and intercultural developments in every participating country applying the system of measuring instruments approved; and
- comparison of the results obtained and drawing the conclusion about the existing barriers in ICT, e-learning, and intercultural competencies, taking into consideration descriptions of the national specifics of legal, human, social, ethical, and technological factors of their implementation.

A detailed description of the transfer of knowledge and training activities during secondments is given below.

1) Secondment of DSTU, BGKU, HSPU to LU (January–February 2016)

The transfer of knowledge activities during the secondment was focused on:

- Discussing with colleagues from US, BGKU, LU the prospects of creating a new training course in a distance form; there are several options: creating a course for master degree students or creating a course for postgraduate students; the didactic videos, created within WP4, can form the basis for the course;
- Participation in the Project Seminar "Are you prepared to be a teacher in the 21st century?" with a keynote speaker, prof. Pedro Veiga, Lisbon University. The main ideas were connected with his experience as the vice-rector of the Lisbon University. Prof. Eugenia Smyrnova-Trybulska presented a report about the IRNet project's current state, main outcomes, and prospects. Prof. Antonio dos Reis presented a report about WP4 of the IRNet project. The main focus was on didactic videos. Round table debates included several topics: presentation of contents live and video on demand, LMS and social network in education, presence and online tutoring, remote collaborative work and cloud collaboration, formative continuous assessment and summative assessment, how should we teach and learn in 100 years from now? A very interesting topic was covered by prof. Fernando Ramos – a report about Portuguese didactic videos database for primary school and secondary school. Important comments about webinars were made by prof. Filipe Carrera, experienced in webinars.
- Contributing to the IRNet blog – "To be a 'blended' b-teacher in the 21st century – reflections" – available at http://areis-en-bteacher.blogspot.pt/; preparing English and Russian subtitles for more than 20 didactic videos; our group, in addition, prepared the video about formative assessment.

The following workshops took place:

- 19 January 2016 – Project workshop "Multimedia Storytelling." Prof. Antonio dos Reis conducted the workshop, showing the main ideas of multimedia storytelling. Researchers from BGKU, DSTU, Ukraine, and HSPU, Russia worked out a sample multimedia story to understand the main technology and approach.
- 19 January 2016 – Project seminar and workshop conducted by prof. Nataliia Morze with participation researchers from BGKU, DSTU, Ukraine, and HSPU, Russia. It included discussing WP4 results and remaining outcomes (subtitles for didactic videos), debating on WP5 goals, and sharing experiences on the discussed aspects.
- 26 January 2016 – Project workshop "Software for making subtitles," conducted by prof. Antonio dos Reis with participation of researchers from BGKU, DSTU, Ukraine, HSPU, Russia, and LU, Portugal. It included presentation of the "Subtitle Edit" software and exemplification of its use for making subtitles.

- 27 January 2016 – Project workshop on ICT tools of subtitle captioning for academic and didactic videos conducted by prof. Paulo Pinto, LU, Portugal and prof. Antonio dos Reis, the Graal Institute, Portugal. The software for automatic subtitle captions was presented. The BGKU team members could create and edit their own subtitle captions for the WP4 project report videos. A case was evoked through the workshop that the automatic and hands-on subtitle captions can be for different types of student training activities in narration, translation, text editing, and storytelling. The general principle of MOOC subtitle caption creation and use was discussed. Automatic subtitle captions are generally considered more preferable and efficient by MOOC creators.
- 1 February 2016 – Project workshop "ICT tools in education, teacher skills," including discussion with professors of the University of Evora concerning application of ICT in education, preparing for the seminar on 2 February 2016, and discussing the seminar agenda.
- 2 February 2016 – Project Seminar "Are you prepared to be a teacher in the 21st century?"
- 4 February 2016 – Project workshop "Digital and traditional didactic tools in education and Robotic in elementary school" during the visit of the Evora University and elementary school. It is one of the oldest universities in Portugal. The particular interest is that the university combines historical traditions and innovative technologies. Activities included: visiting the historic university halls, taking part in the discussion with the university staff about the use of ICT, e-learning in their educational programmes.
2) Secondment of HSPU to UT (March–April 2016) – has been implemented in LU, Portugal in January–February 2016 instead of UT (March–April 2016)
3) Secondment of US, UEX, UKF, UT to HSPU (March–April–May 2016)

The transfer of knowledge activities during the secondment was focused on the development of the verified in empirical research e-learning MOOC course "ICT-tools for e-learning," improving efficiency of the educational process-oriented development of ICT and e-learning competencies, and other components of the system such as content, means, methods, forms of teaching, and so on. What was analysed were the theoretical-methodological bases of effective use of the ICT and remote forms of teaching in education in higher pedagogical educational institutions: pedagogical theories (such as behaviourism, constructivism, connectivism, constructionism, programming teaching), methods, organisational forms, means, contents, and taxonomy. The curriculum of an international MA course "E-learning in cultural diversity" was developed.

The following workshops took place:

- 6 April 2016 – workshop on 3D technology, conducted by dr Martin Cápay from UKF, Nitra, Slovakia, with participating of the IRNet researchers prof. Tatiana Noskova, prof. Tatiana Pavlova, and dr Olga Yakovleva from HSPU, RU, Slovak researchers from UKF dr Martin Drlík, dr Martin Cápay, dr Julia

Tomanová, dr Peter Švec, and prof. Eugenia Smyrnova-Trybulska from the University of Silesia, Poland.

- 6 April 2016 – participation in the workshop on robotics in education, conducted by graduates of an MA course presenting their diploma projects, HSPU, SPb, Russia.
- 11 April 2016 – IRNet meeting, workshop, and seminar on WP5 with participation of prof. Tatiana Noskova, prof. Tatiana Pavlova, and dr Olga Yakovleva, Slovak researchers from UKF dr Martin Drlík, dr Martin Cápay, dr Julia Tomanová, dr Peter Švec, conducted by prof. Eugenia Smyrnova-Trybulska from the University of Silesia, Poland.
- 13 April 2016 – international conference *New Educational Strategies in the Contemporary Information Environment: E-learning Methodology*. Events included: a plenary session, a thematic conference session, round table debates, and workshops. A lecture "Selected Aspects of Effective Use of Didactic Videos and MOOCs in Education" was delivered by prof. Eugenia Smyrnova-Trybulska from the University of Silesia.
- 18 April 2016 – IRNet seminar and workshop, conducted by prof. Eugenia Smyrnova-Trybulska from the University of Silesia, Poland, on IRNet research results WP2, WP3, and WP4 with participation of prof. Tatiana Noskova, prof. Tatiana Pavlova, and dr Olga Yakovleva from HSPU, Slovak partners from UKF: dr Martin Drlík, dr Martin Cápay, dr Julia Tomanová, dr Peter Švec, and researchers from the University of Potsdam, Germany, dr Rainer Herbst and dr Jan Knut.
- 18 April 2016 – workshop of master degree students within a framework of UNESCO master degree module "Social media and new educational practices." During the seminar master degree students presented their projects in social media. The seminar was participated by prof. Tatiana Noskova, prof. Tatiana Pavlova, and dr Olga Yakovleva, dr Martin Drlík, dr Martin Cápay, dr Julia Tomanová, dr Peter Švec, prof. Eugenia Smyrnova-Trybulska, and prof. Rafael Martin Espada and prof. Juan Arias from the University of Extremadura, Spain.
- 19 April 2016 – meeting with students, giving a presentation about the IRNet project and use of ICT and e-learning in partner universities by prof. Rafael Martin Espada, prof. Eugenia Smyrnova-Trybulska, dr Rainer Herbst, and dr Jan Knut.

There were also round table debates and presentation of reports by colleagues from the University of Potsdam, Germany. Topics were:

- computer modelling as a basis of the virtual particles and objects of microscopic size;
- visualisation of scientific data in the form of three-dimensional topologies; and
- three-dimensional printing, three-dimensional visualisation of the training materials and models for lectures and seminars at the University of Potsdam.

4) Secondment of US, OU to BGKU (April 2016)

The transfer of knowledge activities during the secondment was focused on analysing and studying the use of ICT in development of the intercultural competence.

The following workshops took place:

- 21 April 2016 – workshop "Intercultural competence – general information" conducted by researchers from US, Poland – dr hab. Barbara Grabowska, dr Łukasz Kwadrans, dr hab. Anna Szafrańska-Gajdzica – with participation of students and academic teachers from BGKU, researchers from OU, the Czech Republic.
- 26 April 2016 – workshop "Relations between teacher and culturally different learner" conducted by researchers from US, Poland – dr hab. Barbara Grabowska, dr Łukasz Kwadrans, dr hab. Anna Szafrańska-Gajdzica – with participation of students and academic teachers from BGKU, researchers from OU, the Czech Republic.
- 29 April 2016 – workshop "Work with learner with special educational needs" conducted by researchers from US, Poland – dr hab. Barbara Grabowska, dr Łukasz Kwadrans, dr hab. Anna Szafrańska-Gajdzica – with participation of students and academic teachers from BGKU, researchers from OU, the Czech Republic.

5) Secondment of DSTU, BGKU, HSPU to UKF (April–May 2016)

The transfer of knowledge activities during this secondment was focused on development of a computer-oriented methodical and theoretical scientific system of contemporary specialists training (the future and in-service teachers, leadership, etc.), the use of ICT and remote forms of teaching in science, and their future professional activity. These issues were discussed during formal and informal meetings during the DIVAI conference with prof. Eugenia Smyrnova-Trybulska and all coordinators (Nataliia Morze, Martin Drlík, Tatiana Noskova) and researchers from HSPU, DSTU, UKF, and BGKU.

According to the roadmap developed by the coordinating university (BGKU), the computer-oriented methodological and theoretical scientific system for training contemporary specialists will be developed partly in the format of MOOC and in the Moodle environment; it will contain the following components:

- introduction; expected results and outcomes;
- e-learning in higher education; comparison of traditional and innovative methods and technologies; 21st century skills and e-learning; the system of ICT tools for developing skills and 21st century implementing e-learning in modern universities and institutes of teacher training; taking into account learning styles;
- tools for adaptive learning; learning styles;
- tools for presentation of content;
- tools for making didactic videos;
- tools for mind maps and infographics knowledge;

- the systems of distance learning;
- tools for communication and collaboration;
- tools for formative assessment and control; and
- storytelling.

The responsibility of the IRNet team was to work on tools for mind maps and infographics knowledge; in order to perform this task researchers from DSTU started the review of tools presented online and consulted Jane Hart's list to check the actual interest of learning community in separate tools for systematic knowledge representation. The results of the research into these tools will become a part of an e-learning course and will be presented at the upcoming conferences, scheduled within the project agenda.

Workshops:

- May 2016 – during a series of meetings and workshops the main question of developing a MOOC and a course in LMS Moodle as one of the core results of WP5 was discussed. Together with the coordinator of WP5, prof. Nataliia Morze, the main outline of the MOOC course was worked out, and the questionnaire for teachers and students about their outlook on MOOCs was developed.
- 6 May 2016 – IRNet meeting and workshop on mobile technologies in education, conducted by dr Martin Drlík, dr Martin Cápay, dr Peter Švec, dr Julia Tomanová with participation of IRNet researchers from Ukraine, Russia, and Poland, including a presentation of students' projects and a seminar with students of UKF. Students presented their research on programming, augmented reality implementation, and development of computer games for school practice.
- 6 May 2016 – workshop during the visit of the Samsung mobile classroom with the presentation of several examples of its use, conducted by the coordinator of the Samsung mobile laboratory with participation of IRNet researchers from Ukraine, Russia, and Poland.
- 16–18 May 2016 – international workshop "New opportunities in European projects." The main issues discussed were: actual calls under the H2020 programme; the position of Ukraine in EC projects and the possibilities of cooperation in future projects; the position of Russian Federation in EC projects and the possibilities of cooperation in future projects; the development of techniques and technology for increasing of educational and research system; ICT Proposal Day – presentation of experiences, future direction of the use of IT in H2020 programmes; new educational strategies in contemporary digital environment; meeting with prof. Libor Vozar, Dean of the Faculty of Natural Sciences, UKF, Nitra; challenges and prospects in the development of an e-learning system for IT students; how technology and the Internet have accelerated the pace of language change; intercultural competence within the system of higher school teaching; the role of new technologies in the learning process; psychological support of e-learning and distance learning in

technically oriented study programmes; enhancing the quality of administration, teaching, and testing of computer science using a learning management system; challenges and prospects in the development of an e-learning system for IT students; draft proposals for IRSES programmes; enhancing the cooperation in Erasmus+ and Visegrad programmes.

- 19 May 2016 – seminar and workshop in UKF. The following questions were discussed: the organisational forms, models, distance learning and remote types of courses (hybrid (combined)), case-technologies, social media, selected Web 2.0 and Web 3.0. Massive Open Online Courses, virtual classroom, Internet courses, and selected IT tools such as LMS (Learning Management Systems), CMS (Contents Management Systems), VSCR (Virtual synchronous classrooms), SSA (Screen Share Applications), CSA (Contents Sharing Application), cloud computing environment, virtual campus, virtual learning environment and "virtual synchronous classroom" tested during WP4.
- 25 May 2016 – workshop, discussion, and seminar during the visit of a primary school with the programme for talented children with participation IRNet researchers from Ukraine, Russia, and Slovakia.

6) Secondment of US, OU, LU to BGKU (August–September 2016)
   The transfer of knowledge activities during the secondment was focused on:
- analysis of results of the survey for students, future teachers, conducted at the University of Silesia on MOOC, BGKU, other partner institutions, and comparison of results;
- improvement of the MOOC methodology and its implementation;
- preparation of the components of the MOOC "ICT-tools in e-learning";
- development of theoretical-methodological, psychological, pedagogical, and methodological foundations of distance learning science based on Internet technologies;
- presentation of research results during the international scientific conference *Open Educational E-environment of the Modern University*, *(The skills of scientific communication among faculty using repositories, wiki technology, e-libraries)* held on 9th September 2016 at the Borys Grinchenko Kyiv University (BGKU) (Ukraine).
  Workshops:
- 29 August 2016 – workshop, conducted by Director of the library of BGKU, on digitalisation of the hard versions of books using contemporary electrical equipment.
- 9 September 2016 – workshop "STEM-education: a need or a whim," moderated by Anastasiia Tiutiunnyk, within a framework of *Open Educational E-environment of the Modern University*.
- 9 September 2016 – workshop "3D scanner – use in education," moderated by Liliia Varchenko-Trotsenko, within a framework of *Open Educational E-environment of the Modern University*.

- 12 September 2016 – Project meeting, seminar, and workshop in presence and in remote mode on WP6 Methodology with participation of prof. Eugenia Smyrnova-Trybulska, prof. Ewa Ogrodzka-Mazur, prof. Anna Szafrańska-Gajdzica, prof. Barbara Grabowska, dr Łukasz Kwadrans, prof. Paulo Pinto, Prof. Josef Malach, dr Ingrid Nagyova, dr Tatiana Prextova, prof. Nataliia Morze, prof. Rusudan Makhachashwili, and dr Hanna Pavlova, BGKU, UA.

7) Secondment of UEx to HSPU (September 2016)

The transfer of knowledge activities during the secondment was focused on summarising the implementation of all aims and tasks of WP5, elaborating the content for the MOOC "ICT tools for e-learning" (module "Digital Story Telling"), and presenting research results and experience concerning pedagogical and technological aspects of using virtual classrooms.

Workshops:

- 27 September 2016 – workshop entitled "The international educational network programs in HSPU" with participation of professors of the University of Extremadura (Spain): prof. Sixto Cubo Delgado, prof. Prudencia Gutiérrez Esteban, prof. Enrique Iglesias Verdegay, prof. Gemma Delicado Puerto, prof. Rafael Martin Espada, prof. Rocio Yuste Tosina, and of professors of Herzen State Pedagogical University, St. Petersburg (Russia): prof. Tatiana Noskova, prof. Tatyana Pavlova, prof. Olga V. Yakovleva.
- 13 September 2016 – IRNet seminar and workshop in Educational-Computing Laboratory of Network Technologies with participation of the Spanish and Russian IRNet researchers.
- 21 September 2016 – IRNet seminar and workshop within a framework of UNESCO Master degree module "Social media and new educational practices" with participation of the Spanish and Russian IRNet researchers, and HSPU students. Lectures were given by prof. Rafael Martin Espada, prof. Enrique Iglesias Verdegay, prof. Rocio Yuste Tosina, prof. Gemma Delicado Puerto, prof. Sixto Cubo Delgado, and prof. Prudencia Gutiérrez Esteban. Lectures' content was as follows:
  ◦ presentation on the University of Extremadura;
  ◦ presentation on the Department of Educational Sciences;
  ◦ lecture: New educational practices: Virtual synchronous classrooms;
  ◦ lecture: New educational practices: Blended learning in education;
  ◦ lecture: How to use our Personal Learning Environment for teaching and learning?
- 22 September 2016 – virtual meeting and workshop in Adobe Connect with prof. Paulo Pinto to work on the "Digital Story Telling" MOOC module. Coordination and follow-up were provided by IRNet agenda meeting.
- 26 September 2016 – videoconference and workshop on pedagogical and technological aspects of using virtual classrooms for Project participants, conducted by UEx team (Spain).

Theoretical and Methodological Bases

Pedagogical theories included are: behaviourism, constructivism, connectivism, constructionism, programming teaching, and other.

The methods used are:
- general environment of theories and methodologies of online teaching and learning;
- self-learning approaches and techniques;
- learning styles and teaching process;
- objectives and teaching taxonomies;
- teaching and learning methods (methods of the project, wiki, WebQuest; programming learning and teaching; discussion on the course forum, use of social media);
- teaching and learning models;
- methodology and techniques of e-learning;
- methodology of producing e-contents; and
- evaluating of the teachers' skills necessary to work in an ICT environment.

Organisational forms are:
- online learning;
- e-learning;
- MOOCs;
- blended learning;
- distance learning; and
- face-to-face (no more than 50%) (MA courses international (or native)).

Additional contents are:
- teaching Models and forms;
- pedagogic management of the project;
- planning and coordination of courses;
- personal and institutional ICT plans; and
- other.

The means are:
- electronical:
    ◦ ICT applications, educational computer programmes, multimedia, didactic videos, Internet resources, web services (YouTube, Wikipedia, Wiki portals, social media, etc.), component (activity) LCMS systems (Moodle), others;
- partly traditional:
    ◦ books, textbooks, exercise books, printed teaching materials, journals, conference proceedings, monographs, others;
- technologies:
    ◦ LMS system Moodle, other LMS;
    ◦ ICT tools used in MOOC;

- ∘ eDex system; and
- ∘ Web 2.0 and Web 3.0 technologies.
  Taxonomies used are as follows:
- Bloom's Taxonomy;
- Marzano's Taxonomy;
- Dave's Taxonomy; and
- Niemierko's Taxonomy.

Levels of knowledge are described on the example of LMS systems. Knowledge and skills for creation and design of a full distance learning course are:

- **remembering**: can the student recall or remember the information? (define, duplicate, list, memorise, recall, repeat, reproduce, state)
  - ∘ defining the Learning Management System
  - ∘ presenting the list of well-known LMS system
- **understanding**: can the student explain ideas or concepts? (classify, describe, discuss, explain, identify, locate, recognise, report, select, translate, paraphrase)
  - ∘ classifying the LMS systems
  - ∘ identifying the activities of the Learning Management System
- **applying**: can the student use the information in a new way? (choose, demonstrate, dramatise, employ, illustrate, interpret, operate, schedule, sketch, solve, use, write)
  - ∘ choosing the most popular and multifunctional LMS system
  - ∘ illustrating the activities, supported by LMS Moodle
- **analysing**: can the student distinguish between the different parts? (appraise, compare, contrast, criticise, differentiate, discriminate, distinguish, examine, experiment, question, test)
  - ∘ comparing the LMS systems according to some criteria
  - ∘ differentiating the resources and activities supported with different educational activities
- **evaluating**: can the student justify a stand or decision? (appraise, argue, defend, judge, select, support, value, evaluate)
  - ∘ defending own position concerning a more adequate LMS system
  - ∘ evaluating and assessing a DL course according some criteria
- **creating**: can the student create a new product or point of view? (assemble, construct, create, design, develop, formulate, write)

The ADDIE Model – WP5 Groundwork Methodological Framework

The ADDIE model is a framework that lists generic processes that instructional designers and training developers use. It represents a descriptive guideline for building effective training and performance support tools in five phases: analysis, design, development, implementation, and evaluation.

The analysis phase

In the analysis phase, the instructional problem is clarified, the instructional goals and objectives are established, and the learning environment and the learner's existing knowledge and skills are identified. Below are some of the questions that are addressed during the analysis phase:

- Who is the audience and their characteristics?
- Can the new behavioral outcome be identified?
- What types of learning constraints exist?
- What are the delivery options?
- What are the online pedagogical considerations?
- What is the timeline for project completion?
  There have been elaborated:
- the profile entrance for choosing tools for studying;
- the survey entrance for hotel module (on collaboration);
- an example for the evaluation of satisfaction with course materials; and
- an example for the evaluation of the course material students (on the cooperation material).

The design phase

The design phase deals with learning objectives, assessment instruments, exercises, content, subject matter analysis, lesson planning, and media selection. The design phase should be systematic and specific. Systematic means a logical, orderly method of identifying, developing, and evaluating a set of planned strategies targeted for attaining the project's goals. Specific means that each element of the instructional design plan needs to be executed with attention to details.

There have been elaborated:

- an example of goals (in cooperation);
- learning outcomes for the module (cooperation);
- schedule of assessment (for example the cooperation of the module);
- the model used in the exercises to practice skills in one module; and
- an example of a training session based on the use of the module materials – blended learning.
  These are steps used for the design phase:
- documentation of the project's instructional, visual, and technical design strategy;
- applying instructional strategies according to the intended behavioral outcomes by domain (cognitive, affective, psychomotor);
- creating storyboards;
- designing the user interface and user experience;
- prototype creation; and
- applying visual design (graphic design).

The development phase

The development phase is where the developers create and assemble the content assets that were created in the design phase. Programmers work to develop and/or integrate technologies. Testers perform debugging procedures. The project is reviewed and revised according to any feedback given.

The implementation phase

During the implementation phase, a procedure for training the facilitators and the learners is developed. The facilitators' training should cover the course curriculum, learning outcomes, method of delivery, and testing procedures. Preparation of the learners include training them on new tools (software or hardware) and student registration. This is also the phase where the project manager ensures that the books, hands on equipment, tools, CD-ROMs, and software are in place, and that the learning application or Web site is functional.

The evaluation phase

The evaluation phase consists of two parts: formative and summative. Formative evaluation is present in each stage of the ADDIE process. Summative evaluation consists of tests designed for domain specific criterion-related referenced items and providing opportunities for feedback from the users.

Quality Assurance in E-learning Premises

Grifoll et al. (2010) identify the following principles:

1) "The first basic principle declares that providers of higher education have the primary responsibility for the quality of their provision and its assurance. This is a principle that should be developed and implemented in a deeper way. However, e-learning programmes are progressively enrolling students and hiring teachers situated in different countries. Facing this situation, how do we match the primary responsibility with the needed 'secondary' responsibility of QA agencies and other stakeholders? How will international e-learning programmes be externally assessed?"

2) "The second basic principle of the ESG states that the interests of society in the quality and standards of higher education need to be safeguarded; the concept of society here, and taking into account again the possibilities of e-learning programmes to be delivered worldwide, needs also deep reflection. Who represents the society? That is important if we wish to include the voice of society in the quality of study programmes, and in the definition of new proposals" (p. 9).

3) Flipped class methods are implemented.

4) The ECB-checklist method is employed to assess the open e-course, created to implement the IRNet project groundwork findings.

Dissemination of Results (Conferences, Publications)

From the very beginning of the project, the partnership used various dissemination tools to better exploit and improve the project objectives, results, and the transfer of knowledge. National and international conferences as well as publications constituted an important opportunity to share the project initial results and achievements with experts in the field. However, the dissemination of the results obtained within a framework of the project work was also a subject of many other activities, meetings, workshops, and presentations during visits in the host organisations.

Conferences

The partnership of the network organised and hosted 5 important conferences in line with the project objectives. All of these events were attended not only by the network researchers, but also by external participants.

1) 2 February 2016 – international scientific seminar, workshop, and e-round table debate: *Preparing to be a blended teacher in the 21*st *century*, the Lusiada Lisbon University, Portugal, with participation of nearly 35 participants from different countries.

2) 13 April 2016 – International Scientific Conference *New Educational Strategies in the Contemporary In formation Environment: E-learning Methodology* organised by HSPU, SPB, Russia. There were more than 40 participants from different countries: Spain, Poland, Russia, Slovakia, Australia, and other. Activities included participation in a plenary session, a thematic conference session, round table debates. A lecture "Selected Aspects of Effective Use of Didactic Videos and MOOCs in Education" was presented by prof. Eugenia Smyrnova-Trybulska from the University of Silesia in Katowice. The conference was followed by the publication of *New Educational Strategies in Modern Information Space. E-Learning Methodology Proceedings* (Scientific papers). Saint-Petersburg: HSPU, including the best articles, elaborated by conference participants, in particular 4 IRNet papers with some project results.

3) 2–4 May 2016 – International Scientific Conference *DIVAI 2016* (Distance Learning in Applied Informatics), UKF (Slovakia) with participation of more than 80 participants from different countries. A book was published: Turčáni, M., Balogh, Z., Munk, M., & Benko, Ľ. (Eds.). (2016). Proceedings from *DIVAI 2016 – Distance Learning in Applied Informatics. 11*th *International Scientific Conference on Distance Learning in Applied Informatics*, 2–4 May 2016. Constantine the Philosopher University in Nitra, Faculty of Natural Sciences, Department of Informatics. Nitra: Wolters Kluwer, including the best articles, elaborated by conference participants, in particular 5 IRNet papers with project results.

4) 9 September 2016 – *Open Educational E-environment of the Modern University* (*The skills of scientific communication among faculty using repositories, wiki technology, e-libraries*) (http://openedu.kubg.edu.ua/) held at the Borys Grinchenko Kyiv University (BGKU) (Ukraine). Conference objectives were: trends and strategies of the open educational resources development, formation of the university's open educational e-environment as a factor of increasing the quality of education, problems and prospects of interaction of the subjects in the open educational environment in the process of professional training, blended and distance learning as a way of access to quality education, and lifelong learning – the process and the motivation to use open educational resources. A book was published: Morze, N. (Ed.). (2016). *Open educational e-environment of modern university (2)*. Kiev: Borys Grinchenko Kiev University. Retrieved from http://openedu.kubg.edu.ua/journal/index.php/openedu/issue/view/2/showToc#.V-y1IDUudZc, including the best articles, elaborated by conference participants, in particular 10 IRNet papers with project results.

Publications

More than 50 papers were published and submitted by members of the network in the period concerned; near 70% of those papers involve researchers from at least two different participating organisations (EU and third countries). All publications are the outcome of networked research and a result of an active exchange programme. *International Journal of Research in E-learning*, *1*(1), 2015, which started within a framework of the IRNet Project, and *Open Educational E-environment of Modern University*, *2*, 2016, were published.

A List of IRNet-related Publications

1) Smyrnova-Trybulska, E. (2016). Some aspects of increasing the effectiveness and comfort of the scientific and educational process in university electronic environment – A research report. *The New Educational Review*, *45*, 259–272. Retrieved from http://www.educationalrev.us.edu.pl/issues/volume-452016/.

2) Ogrodzka-Mazur, E., Grabowska, B., Szafrańska-Gajdzica, A., & Kwadrans, Ł. (2016). *Education of children and youth in culturally diverse environments: Experiences –problems – prospects*. Munich: LINCOM Academic Publishers.

3) Smyrnova-Trybulska, E., Kommers, P., Morze, N., Noskova, T., Pavlova, T., & Yakovleva, O. (2016). Międzynarodowa sieć naukowa IRNet w dobie nowych technologii, globalizacji i internacjonalizacji edukacji oraz kompetencji kluczowych – wstępny raport z implementacji projektu. *EduAkcja. Magazyn edukacji elektronicznej*, *2*(12),130–138.

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11) Smyrnova-Trybulska, E., Ogrodzka-Mazur, E., Szafrańska-Gajdzica, A., Do-luk, E., Kommers, P., Morze, N., Noskova, T., Pavlova, T., Yakovleva, O., Pinto, P., Arias Masa, J., Cubo Delgado, S., Delicado Puerto, G., Drlík, M., Malach, J., Issa, T., & Romanyukha, M. (2015). Report on the implementation of WorkPackage 2 "Analyses of legal, ethical, human, technical and social factors of ICT and e-learning development and intercultural competences state in every partner country" in the framework of the IRNet project. *International Journal of Research in E-learning*, *1*(1), 99–116.

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Raport z wdrożenia Pakietu Roboczego WP5 „Rozwój metodologii pilotażowej" w ramach projektu IRNet

S t r e s z c z e n i e

Niniejszy artykuł opracowany przez międzynarodowy zespół autorów – badaczy z różnych dziedzin naukowych związanych z ICT, e-learningiem, pedagogiką i innymi powiązanymi z nimi dziedzinami – koncentruje się na celach i niektórych wynikach międzynarodowego projektu IRNet. W szczególności artykuł ten opisuje narzędzia badawcze, metody i pewne procedury Pakietu Roboczego 5 (WP5) „Rozwój metodologii pilotażowej": cele, zadania, rezultaty i realizację podróży badawczych. Badacze z partnerskich uniwersytetów przeprowadzili analizę wyników WP5 w kontekście kolejnych etapów i pakietów roboczych IRNet – Międzynarodowej Sieci Badawczej.

S ł o w a   k l u c z o w e: Międzynarodowa Sieć Badawcza IRNet, ICT, e-learning, kompetencje międzykulturowe, metodologia

Eugenia Smyrnova-Trybulska, Nataliia Morze, Piet Kommers, Tatiana Noskova, Paulo Pinto, Sixto Cubo Delgado, Martin Drlík, Josef Malach, Tomayess Issa, Maryna Romanyukha

Отчет ходе выполнения рабочего пакета WP5 «Разработка экспериментальной методологии» в рамках проекта IRNet

А н о т а ц и я

В данной статье, подготовленной международной группой авторов, исследователей из разных научных областей, связанных с ИКТ, электронным обучением, педагогикой и другими смежными областями, основное внимание уделяется целям и некоторым результатам международного проекта IRNet. В частности, в этой статье описываются инструменты исследования, методы и некоторые процедуры исследования в рамках рабочего пакета 5 (далее: WP5) «Разработка экспериментальной методологии»: цели, задачи, ожидаемые результаты, выполнение научно-исследовательских поездок. Исследователи из университетов-партнеров, проанализировали результаты WP5 в контексте следующих этапов и пакетов работы проекта IRNet – Международной научно-исследовательской сети.

К л ю ч е в ы е   с л о в а: международная исследовательская сеть IRNet, ИКТ, электронное обучение, межкультурные компетенции, методология

Eugenia Smyrnova-Trybulska, Nataliia Morze, Piet Kommers, Tatiana Noskova, Paulo Pinto, Sixto Cubo Delgado, Martin Drlík, Josef Malach, Tomayess Issa, Maryna Romanyukha

Informe sobre la implementación del Work Package 5 "Desarrollo de metodologías piloto" en el marco del Proyecto IRNet

R e s u m e n

Este artículo, elaborado por un equipo internacional de investigadores de diferentes áreas científicas, vinculados con TIC, e-learning, pedagogía y otras disciplinas afines, se centra en los objetivos y resultados obtenidos en el proyecto internacional IRNet. En particular, el artículo describe las herramientas de investigación, los métodos y algunos procedimientos del Work Package 5 (en adelante: WP5) "Desarrollo de metodologías piloto", esto es, objetivos, tareas, productos e implementación de viajes de investigación, en el contexto de las siguientes fases y Work Packages del Proyecto IRNET-International Research Network.

P a l a b r a s   c l a v e: red internacional de investigación IRNet, TIC, e-learning, competencia intercultural, metodología

Miroslav Hrubý
The Czech Republic

Report from the International Conference *Distance Learning, Simulation and Communication (DLSC 2017)* in Brno, the Czech Republic, 31 May – 2 June 2017

The *Distance Learning, Simulation and Communication* (DLSC) conference has been a part of an official accompanying programme of the International Exhibition of Defence and Security Technologies and Special Information Systems at the BVV Trade Fairs since 2009. The event is biennial. DLSC 2009, DLSC 2011, DLSC 2013, and DLSC 2015 proceedings are accessible at the DLSC conference website (http://dlsc.unob.cz). They have been indexed at the Web of Science database (https://apps.webofknowledge.com/). The electronic versions of all DLSC conference printed proceedings can be downloaded, and their use is free of charge.

The DLSC 2017 conference objectives were experience and information exchange in the fields of:
- the current status and prospects of distance learning and e-learning in the preparation of military professionals and other target groups;
- the usage of computer modelling and simulation, especially (but not only) in the command and control process; and
- language education of military professionals and other target groups, as well as current and future communication systems, their development and usage.

The event was organised by: the University of Defence (Kounicova 65, 662 10 Brno), the Centre of Simulation and Training Technologies (Kounicova 44, 662 10 Brno), BVV Trade Fairs (Výstaviště 1, 647 00 Brno), and the Union of Czech Mathematicians and Physicists, Brno branch (Janáčkovo nám. 654/2A, 602 00 Brno).

The main parts of the DLSC 2017 conference programme were as follows:
- Wednesday, 31 May
  - Ice-breaking evening of the DLSC 2017 participants at the University of Defence Club.

- Thursday, 1 June
  - Keynote lecture "Virtual reality and its role in education" by Ľubica Stuchlíková from the Slovak University of Technology in Bratislava;
  - 4 blocks of presentations; and
  - networking evening at the Starobrno brewery.
- Friday, 2 June
  - 2 blocks of presentations and
  - time for visiting the IDET 2017 exhibition.

The DLSC 2017 conference participants have received two publications. The first one is *Distance Learning, Simulation and Communication 2017 CD Proceedings*, which contains 47 accepted conference papers prepared by the authors from Austria, the Czech Republic, Poland, Russia, the Slovak Republic, and Ukraine. The second one is *Distance Learning, Simulation and Communication 2017 Proceedings (Selected papers)*, a printed version containing 30 selected papers from the total number of 47 accepted conference papers. The selection was done due to the reviewers' recommendation. Altogether 30 reviewers from 10 countries participated in the DLSC 2017 reviewing process. The printed conference proceedings were sent for evaluation with the aim of their inclusion into the Thomson Reuters Web of Science database.

Figure 1. Ľubica Stuchlíková (the Slovak Republic) presenting the DLSC 2017 keynote lecture "Virtual reality and its role in education." Photo by Miroslav Hrubý.

Figure 2. Anna Ślósarz (Poland) presenting her paper "Subject and prospects for the study on distance learning (DLSC 2009–2015, Brno)" in the block headed by Eugenia Smyrnova-Trybulska (Poland). Photo by Miroslav Hrubý.

Figure 3. The final photo of a part of DLSC 2017 conference participants in front of the conference room – Congress Centre, room B, BVV Trade Fairs, Brno, the Czech Republic.

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2. *Use of e-learning in the training of professionals in the knowledge society*. Monograph. Ed. E. Smyrnova-Trybulska. Cieszyn: Wydawnictwo Uniwersytetu Śląskiego, Studio Noa, 2010, 344p. ISBN 978-83-60071-30-4.
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2. *Zastosowanie systemów CMS w tworzeniu przestrzeni informacyjno-edukacyjnej w Internecie*. Podręcznik akademicki. Ed. E. Smyrnova-Trybulska, S. Stach. Authors: E. Smyrnova-Trybulska, S. Stach, B. Fuklin, D. Staniek. Katowice: Wydawnictwo Uniwersytetu Śląskiego, Studio Noa, 2012, 194p. ISBN 978-83-60071-55-7 (http://www.wydawnictwo.us.edu.pl/node/3731).