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## EXPERIENCE OF THE UNIVERSITY OF AVEIRO IN INNOVATIVE TEACHING APPLICATIONS

Nowadays Higher Education Institutions are increasingly using innovative computer technologies to make their academic communities a part of global-scale technology-enhanced learning processes. The purpose of the current research is to consider some innovative communication technologies developed and disseminated at the University of Aveiro, which is one of leading Portuguese Research&Development institutions and a member of European Consortium of Innovative Universities. The academic novelty of the article is the first attempt in the Ukrainian scientific discourse to shed light on four major projects designed and launched at the University of Aveiro, namely the Learning Management Systems SAPO Campus and MOODLE, 3D Virtual Classroom project Second Life tools, and a game-based project EduPARK, which promote e-learning and m-learning at different educational levels. The research provides theoretical explanation of key concepts of technology-enhanced learning (e-learning, blended learning, LMS, 3D Virtual Classroom, etc.) and offers a brief literature review concerning some qualitative and quantitative data analysis of the above-mentioned projects. The successful innovative experience of the UA could be a good example of CT implementation at academic level for the Ukrainian higher education institutions and help promote the concepts of so called no-walls school, Open and Social University and Digital Identity in domestic science and education.

**Key words:** e-learning, m-learning, 3D Virtual Classroom, SAPO Campus, MOODLE, Second Life tools, EduPARK.

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## ДОСВІД УНІВЕРСИТЕТУ АВЕЙРУ В ЗАСТОСУВАННІ ІННОВАЦІЙНИХ НАВЧАЛЬНИХ ТЕХНОЛОГІЙ

У статті розглянуто інноваційні комунікаційні технології, розроблені та запроваджені в Університеті Авейру, що є одним із провідних португальських науково-дослідних закладів освіти і членом Європейського консорціуму інноваційних університетів. Наукова новизна статті полягає у першій спробі в українському науковому дискурсі розглянути чотири вагомні проекти, розроблені в університеті Авейру, а саме: системи керування навчанням SAPO Campus та MOODLE, 3D інструменти для віртуальної аудиторії Second Life та проект EduPARK, реалізований на основі ігрової методології. Успішний інноваційний досвід Університету Авейру може стати добрим прикладом впровадження комп'ютерних навчальних технологій на академічному рівні для вищої школи України та сприяти популяризації концепцій так званої школи без кордонів, Відкритого університету та цифрової особистості у вітчизняній науці й освіті.

**Ключові слова:** онлайн навчання, мобільне навчання, 3D віртуальна аудиторія, SAPO Campus, MOODLE, Second Life tools, EduPARK.

**Problem statement.** The University of Aveiro (UA), being a member of ECIU (European Consortium of Innovative Universities), is one of the leading centers of innovations application in general and innovative education technologies in particular. It has been focused on the development and investigation of various modes of e-learning at Higher Education Institutions (HEIs) [14, p. 2]. A lot of e-learning projects and initiatives were launched in the University, namely SAPO Campus, Virtual learning environment Second Life tools, EduPARK game were created on its basis. Regarding an urgent need for the introduction of modern e-learning technologies in Ukrainian HEIs, the experience of this Portuguese university could be a good example of establishing a culture of openness and interaction at multiple levels in educational sphere. The lack of works focusing on the usage of ICT technologies in the UA in domestic scientific literature accounts for the **topicality** of the current research. Therefore, the **aim** of the article is to consider communication technologies developed and implemented in the Aveiro University and in this way to disseminate innovative practices for various modes of learning. The research involves the following tasks:

- 1) to provide a theoretical explanation of the key concepts described in the article;
- 2) to analyze these concepts in the context of teaching practices at the University of Aveiro.

**Statement of the basic material** Modern-day scientists distinguish such distance learning paradigms: e-learning, which reflects Bologna recommendations and encourages the single European Information Space; blended learning, which combines assets of on-line courses without the loss of face-to-face contact; mobile learning, which presupposes the use of mobile devices enabling people to get a permanent access to information anytime anywhere [13, p. 183].

e-Learning, as a synonym of distance learning, virtual learning, e-Instruction in its broad meaning, reflects humanistic approaches to education which sets the learner at the center of the process of education, making the learner responsible for knowledge construction and is a part of a technology shift, which broadened learning and teaching possibilities. As technology continuous to advance, there are innumerable ways to design and deliver education at a distance. M. Pinto et al. defined such perspectives for communication technologies research (CTs):

- Specific uses of CTs by students and approaches to teaching;
- Institutional perspective of the current strategies and practices of academic and administrative use of web 2.0 tools.

Having analyzed the literature review concerning the usage of communication technologies in HEIs, Pinto et al. present such taxonomy:

- Learning management systems;
- Publishing and sharing technologies (blogs, wikis, YouTube, etc.);
- Social Networking (Facebook, Academia.edu);
- Collaboration technologies (Google Docs, Social Bookmarking);
- 3D virtual environments (Second Life, Habbo) [13, pp. 183-184].

According to a research, presented in 2016 by L. Pombo et al., in Portuguese universities the most popular are Learning Management Systems, which are available at 86% HEIs and «are probably the most recognized and dominant CTs in the academic context» [14, p. 5]. Additionally, Content Aggregation technologies and Web 2.0 tools (in general) are also at the top of the list [14, p. 5].

There are different synonymic definitions of computer education applications: e-Learning Systems, Learning Management Systems, Course Management Systems, Content Learning Management Systems or even Virtual Learning Environments. Some scientists believe there are over ninety different LM systems, ranging from the most basic text-driven model to systems that offer social learning features [fluency p. VII]. An LMS as MOODLE (Modular Object-Oriented Dynamic Learning Environment) is an open source solution type system and is the most commonly used in the higher education sphere and is characterised as a set of functionalities: resources which are created and then uploaded to the platform and modules which are created via MOODLE [6, p. 336]. The MOODLE instance at the University of Aveiro incorporates a set of tools that can be used in the teaching and learning process: Modules from the standard MOODLE platform that provide interaction among students and teachers (e. g. Database, Calendar, Assignments, Workshops, Glossary, Chats, Forums, Quiz, Survey, News and Feedback) and external tools that are embedded in the platform, namely Questionnaires and Video-conferences, Blogs UA and Wikis UA, [6, p. 337]. In accordance with data of investigation presented by C. Costa et al., the main purpose of using Moodle is to “Download materials” (98% of participants) and “See News” (84%) [6, p. 339]. The results can be interpreted as seeing MOODLE mainly as a repository of materials. Besides, it can be noticed that students who use the tools assign more importance to them. When asked to evaluate modules according to their importance, students chose ‘News’ and ‘Assignments’ as the most essential tools, while ‘Quiz/Survey’, ‘Questionnaires’, ‘Forums’ and ‘Wikis UA’ were put at an intermediate level of importance, and less important were considered to be ‘Chats’, ‘Blogs UA’ and ‘Video-conference’. [6, p. 341]. Moreover, the further study, carried out by C. Costa et al. and published in 2015, revealed that a tendency to use MOODLE platform as a storage of materials at the UA remained dominant, and the most popular materials for downloading were texts and slides [5, pp. 20-25].

Another successful example of institutional Learning Management System offered at the University of Aveiro is SAPO Campus.

SAPO Campus is a platform that is institutionally supported and integrates web 2.0 services that allow the content sharing in a safe environment. It was developed as a mutual project of SAPO (the Internet provider in Portugal) and the Department of Communication and Art in the UA and launched in 2009. The initial goal of this learning platform was derived from the concepts of Open and Social University and Digital Identity which are aimed at meeting the needs of new typologies of students and building up a so called no-walls school. This platform works at two levels, the first layer provides necessary tools for data aggregation and processing while the second one enables users to communicate, share resources and follow community news. Its developers see its main advantage in the opportunity to learn from others: «Each learner has a significant amount of implicit and explicit information that can be relevant to the community. Users should share the final result but also should learn to share the process. The learning experience as a whole could be meaningful for others to learn with» [17, p. 41]. According to the surveys conducted among users of this learning platform, it is mostly popular with undergraduate and master students whose computer literacy is above the average level. They use this platform for institutional goals mostly to exchange emails, share texts, edit text online, do social bookmarking, etc. while for personal use they prefer chats, photo and video sharing, blogs, forums [18]. Additionally, this platform was complemented with a recommender system which pre-selects people and content of educational value a user might be interested in. As a result, every registered learner has one’s personal environment related to the sphere of one’s interests [11]. Although the platform was initially created for higher education, now it is offered to other education levels [12]. Thus, in 2012 SAPO Campus comprised more than 145 schools that used the platform as well as various institutions, including Non-Governmental Organizations such as Khan Academy (a partnership between the Portugal Foundation Telecom and Khan Academy that provides translated videos on Mathematics, Physics and Chemistry into the Portuguese language) [19, pp. 132-144].

An important direction in the development of innovative technologies in teaching practices at the UA is 3D Virtual Classrooms. Thus, 3D Virtual Classrooms have been investigated under a joint research initiative between the Department of Communication and Arts of the University of Aveiro and PT Inovação aiming to enrich Formare (the LMS developed and marketed by PT Inovação, a flexible integrated service of e-learning and b-learning that supports education in the Internet environment and promotes multimedia education) [1, p. 36].

One of the most widespread and recognized 3D virtual environments is a social educational network called Second Life tools. Most learning systems are asynchronous and don't allow an effective real-time interaction, collaboration and cooperation. Second Life tools offer a range of possibilities for training courses as an extension of the typical learning LMS platform, as it provides its users with immersive experiences allowing opportunities to simulate real life and role-playing activities [1, p. 37]. A. Loureiro defines Second Life as a free to use 3D multi-user virtual world, immersive, imagined, designed, built and created by its users (residents or avatars) and argues that students feel more confident and more open in 3D virtual world applications [8]. The evident benefits of SL tools include the opportunity for learners to collaborate with each other in order to complete teamwork, improve their soft skills, develop creativity, create new context and share this process with others, work in a more or less comfortable zone as real users are hidden behind avatars, gain confidence in communication in real-life situation, release stress before performing duties in a real job, etc. Moreover, this 3D environment stimulates a high level of engagement and motivation in students. [1, pp. 35-36]

The Department of Communication and Art of the University of Aveiro and PT Inovação (PTIn), the research company of Portugal Telecom, developed several SL projects to meet the needs of students and trainees in various contexts. For example, they designed an online course for trainees of a Portuguese Bank. This online program consists of two parts. At the first stage users are given lessons with a short list of questions. At the second stage participants can test their theoretical knowledge in a virtual working environment. Such an approach allows to save money on real space and equipment for educational institutions and business companies and save time on transportation costs for students. The training course evaluates both soft and hard skills of trainees. Thus, the database that traces the performance of a student assesses his or her decision-making abilities, stress resistance and particularities of behavior with customers and other agents. In a virtual bank office trainees are given ordinary tasks such as dealing with a client who wishes to make a deposit. However, they might face various conflicts or misunderstandings with customers and try to solve them. Apart from tutorial videos and instructions, trainees can record their performance and analyze it later. The system also provides a way for communication between a trainer and a trainee. The first can provide guidance, ask questions and evaluate the trainee's performance, the latter can ask and answer questions, even use a «panic button» to receive help. It is interesting to note that the system does not grade students, this responsibility rests on the shoulders of a teacher. All in all, SL tools help to prepare future experts in a highly motivating 3D environment at relatively low costs [1, 38].

Additionally, the UA developed the U-TRACER tool aimed at collecting and processing data about the use of CTs in Higher Education Institutions. This tool helps gather statistics about the types of users of CTs, their opinions and perceptions, frequency of applications usage and also helps outline the future trends in the development of innovative technologies in education [13, p. 181].

Another important sphere of technology-enhanced learning at the UA is mobile learning. In the European region, the use of mobile learning is already a reality. As a result, studies in the field started to arise in Portugal, both at the higher education level and at the secondary education level. With mobile learning teachers can review teaching material, update the information and send messages to students. Students can access the m-learning environment any time so the environment is considered to be a facilitator for teaching material distribution [16, 460]. Cloud Computing offers a way to obtain computing resources on demand, rather than having to commit unnecessary hardware [9]. The emergence of Personal Learning environments has greatly facilitated the use of sharing of open and reusable learning resources online. Learners can access, download, remix and republish a wide variety of learning materials through open services provided in the cloud [10], available on their phones. Taking into account new trends, the University of Aveiro developed a project called EduPARK game, designed for school children aged from 9 to 14. The purpose of this project is to promote autonomous m-learning on various school topics in the outdoor settings, namely in an urban park. It combines geocaching tasks and various multidisciplinary exercises, which can have various target groups: students, teachers and even tourists. Games often offer a competition for its participants and this detail also contributes to a high level of motivation. At a school level, game-based learning increases pupils' engagement and motivation. The application on a mobile phone contains a short tutorial, help section, information about a learner's or the whole team's performance, the number of correct or wrong answers, completion time, etc. As for tools, the app EduPARK game offers a map of a park, a compass, and a camera. The learners follow instructions, move around a park and do the tasks. The analysis of the focus groups' perceptions revealed that pupils positively evaluated an opportunity to enjoy a physical contact with the objects they were searching for and to socialize and compete with their peers outdoors [15, pp. 95-96]. All in all, moving learning beyond a classroom and developing game-based learning projects go in line with a fast-pacing overall technological progress and is aimed at meeting demand of new typologies of students.

**Conclusion** To sum up, the Aveiro University experience in innovative teaching applications is a significant and valuable contribution to a global-scale process of promotion and implementation of e-learning. The University Learning Management System SAPO Campus was launched in 2009 and has been successfully introduced for different educational levels. Additionally, its version of 3D Virtual Classroom Second Life tools enabled institutions and users to considerably reduce institutional and personal spending as well as help trainees role-play their future duties in virtual working settings. Moreover, the UA welcomes the increase of mobile learning and developed a project EduPARK with the intention to move beyond a concept of a Smart Urban Park to a Smart City. The UA's experience goes in line with emerging tendencies in technology-enhanced learning and could be used for further investigations as a good example for the Ukrainian Higher Education Institutions interested in the development of IT factors in education.

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