

E-LEARNING - EVOLUTION, TRENDS, METHODS, EXAMPLES, EXPERIENCE

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ABSTRACT

The article focuses on an overview of evolution, trends, methods, examples and analyses of the experience of e-learning. The author presents theoretical and practical aspects of the use of e-learning in higher education, based on her own long-time experience. The paper comprises a description of stages of e-learning evolution and discusses such aspects as current and future trends (in addition to the LMS system / Next-Generation LMS also Augmented and virtual reality, Artificial intelligence, Natural User Interface, Videos, Podcasts); methods (Problem-based learning; Project-based learning; Inquiry-based learning; Flipped Classroom; Digital Storytelling; Gamification; App-based learning, Video-based learning); examples of experience (projects (earlier, current, and future (UPGOW, IRNet, Faculty Distance learning platform, MOOCs, teacher training in the area of innovative technologies and methods)), analysis of E-learning and universities' electronic environment.

KEYWORDS

e-Learning, Evolution, Trends, Methods, Technologies, Experience

1. INTRODUCTION

“E-Learning is a new educational paradigm in the age of information technology. These days, most universities worldwide consider e-learning as a strategic asset to make education accessible to everyone.” (Sohrabi, Vanani, Iraj, 2019)

The conceptual basis for the creation and functioning of modern systems of teaching and learning in remote mode and e-learning includes: the theory of the constructivism (Bruner, 1960, 1974, Piaget, 1977, 1985, 1995, 1996, Papert, 1991, 1992, 1996, Vygocki, 1982, 1991), behavioral learning concept (Skinner, 1968, 1976, 1986, Thorndike, 1927, 1990, Watson, 1990), humanistic pedagogy (Dewey, 1910, Maslow, 1969, Strahan, Rogers, 2012), cognitive basics of learning (Bruner, 1960, 1974, Piaget, 1977, 1985, 1995, 1996, Vygockij, 1982, 1991, Smith, 2007, Hayes, 1978), functional theory (Davydov, 1986, Gal'perin, 1976, Talyzina, 1969, 1975; Vygocki, 1982, 1991; Krygowska, 1977), the theory of developing teaching (Davydov, 1986, Leontev, 1997, Elkonin, 1984), sociocultural theory, built on the notions of intersubjectivity and its immediate development zone (Vygockij, 1982, 1991), theory of connectivism (Downes, 2012; Levy, 1994, 1997, Siemens, 2005, 2013, 2014), theory of problem-oriented learning (Group “Awareness and Technologies” Vanderbilt University, Cognition and Technology Group at Vanderbilt University, 1990, 1994), theory of cognitive flexibility (Spiro, Coulson, Feltovich, Anderson, 1988; Feltovich, 1992), reflexive teaching (Schoenfeld, 1987, 1992, Woronowicz, 1997), situational models of cognition processes (Brown, Collins, Duguid, 1989), the model of “shared cognition” (Oshima, 1995, 1996; Bereiter, Scardamalia, 1994, 1995, 1996), the teaching and learning model of “master-student” and many others (Smyrnova-Trybulska, 2018), research concerning designing an Integrated Web-based Personal Learning Environment conducted by Amberg, Reinhardt, Haushahn, Hofmann (2009), new methods of e-learning focuses in research areas Malach Kostolányová, Chmura M., Prextová (2016).

Simultaneously, we could observe that the technologies are developing faster than methods and faster than users become prepared to use them. It is a great problem, a challenge and a contradiction. This article is devoted to an analysis of certain aspects and solutions to this issue.

2. EVOLUTION OF E-LEARNING

“The technological evolution during the last 7 decades could bring down one “room computer” (Mark I, 1943) weighting several tons into a small tiny laptop, weighting just a few grams and a thousand times more powerful than his “grandfather”. (Reis, 2010: p.13)

E-learning is unrelated to the technological progress, scientific development, development of computer hardware and means of communication. The history of the computer dates back to 1940's. The mechanical computing machine - 600 years, basic tools to perform calculations - 3000 years.

“This technological revolution was followed by an enormous change in methodologies and didactic tools where adjusted in a view to their implementation.” (Reis, 2010: p.13).

In his own research A.D.Reis (2010) analysed the evolution of e-learning and stages, conditions, in particular he noted that one of the important educational as well as technological event in this subject area was: “Skinner introduced in 1954, CAI (Computer Assisted Instruction) in his classic article (“The science of learning and the art of teaching”) and summarized the basics about “The teaching machine”. The teaching machine and the programmed texts are the previous format of CBI (computer based instruction) turned into reality later with the PCs.”

During the last decades the concept of e-learning has changed and evolved. It can be typified in *five* different phases. What distinguishes the different phases is: the presence of interactivity or not; the existence or not of *multimedia contents*; and the existence of *synchronous and asynchronous online support, elements of augmented reality and virtual reality, artificial intelligence and learning assistance*. The evolution of technology, pedagogic methodology and teacher skills allow us today to use all the above mentioned approaches. (Reis, 2007)

- I. First distance learning stage (-> 1970): course contents were totally delivered by regular mail (Reis A. (2010). s.15)
- II. Second stage (1970 -1980): Open Universities
- III. Third stage (1980 - 1990): Video cassettes and TV
- IV. Forth stage (1990 - 2000): Computers, multimedia, interactivity, e-Learning
- V. Online Learning Environment (Reis, 2010, p.15)

According to other research (Lamandini 2009), there were “limits of e-learning 1.0. Although in recent years there has been a steady increase in the number of e-learning projects with the extensive use of technology platforms (LMS Learning Management System or Virtual Learning Environment VLE), in fact few of them have caused significant changes in terms of stability and the quality of learning. The reasons are:

- excessive focus on technological aspects,
- lack of effectiveness of adopted teaching strategies,
- poor skills in the field of design and management and greater emphasis on the economy than on the use of technology for innovation, improvement and strengthening of the learning process.”

The next generation of e-learning according to (Lamandini 2009) is Web 2.0 and e-learning 2.0. “In Web 2.0 (Tim O'Reilly) the network is more interactive and dynamic, and users, more than technology, add value to the services offered by the network. Thanks to the participative architecture provided by new applications, each person can become an actor and author of content (content generated by the user or UGC), exchange and share (social networks), in accordance with participative methods and cooperation with the rest of the "community". The network becomes a place collective intelligence (P. Lévy), dispersed everywhere and constantly improved and the place of collective intelligence (D. De Kerckhove), which, privileged by connections, is activated in order to solve specific problems practically, multiplying knowledge and skills.”

“New technologies facilitate communication and joint construction of new knowledge in communities and between different communities. This transformation of new ways of learning is characterized by innovative models of e-learning and the learning environment, which leads to the definition of e-learning 2.0 (Stephen Downes, 2004). It aims to regain the potential associated with spontaneous, informal (Bonaiuti, 2006) ways of using the network, both through individual learning and through building a network of experts, communities of interest that spontaneously aggregate to solve specific problems. The network becomes a training environment for the integration between formal and informal learning and is implemented by developing the concept of the *Personal Learning Environment or PLE* (Tosh and Wermuller, 2004, Wilson, 2005).” (Lamandini 2009).

Among contemporary trends and direction of development of e-learning the following can be distinguished: *Augmented and virtual reality, Artificial intelligence and learning assistance.*

- *Augmented Reality (AR)*: Overlay of content (video, photo, sound, GPS data, etc.) onto the real world. Real world and overlaid content cannot interact with each other. (Dirksen, J., DiTommaso D., Plunkett, C. 2019).
- *Virtual Reality (VR)*: Simulates a world (real or imagined) and allows the user to interact in that world. (Dirksen, J., DiTommaso D., Plunkett, C. 2019.)
- *Artificial intelligence and learning assistance.* Timeline (figure 1) shows the evolution of the development of e-learning trend in the last decade.

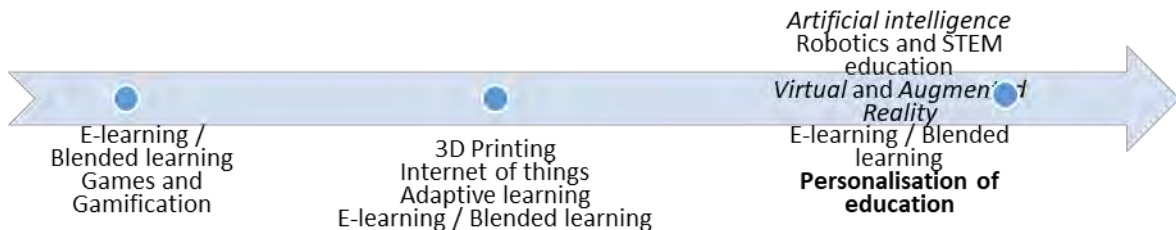


Figure 1. Timeline of the evolution of the development of the e-learning trend in the last decade

The final sentence of a Contemporary education is constantly innovating and adapting to new generations of students and to the fluctuating demands of the job market. Independent, collaborative and lifelong learning, self-regulation and high-order thinking skills are some of the dominant keywords for academic and professional achievement of the 21st century. The development of such competences requires an educational system that moves beyond the traditional delivery of content through the conventional lecture format. While active learning is far from being a novel concept in education, it is progressively being cited as a valuable method for the promotion of the abovementioned skills. It fosters student engagement, self-directed learning and student collaboration by requiring the students to take action in the classroom. Active learning can assume a variety of shapes and is, therefore, a method that can be interpreted by lecturers according to a wide range of definitions (Isaias, 2019, p. xiv).

3. ACTIVE TEACHING / LEARNING METHODS

J. Dewey and K.D. Ushinsky substantiated, from the point of view of psychology, the most important didactic principles of teaching education: visibility, systematic and consistent, thoroughness and strength of assimilation by students of educational material, a variety of methods of teaching, in particular active methods teaching and learning. In the conditions of global implementation and use of digital technologies, in particular in education, the conditions and possibilities of using teaching methods and didactics principles change.

Definitions of these contemporary active teaching / learning methods, which are more adequate and effective in conditions of digital tools support, include in particular:

- *Adaptive learning* - supported by confidence-based assessments and strong analytics and measurement of training effectiveness, is taking learning to the next level. LMSs are slowly gearing up to compete with platforms that are offering adaptive learning. (Kumar 2018). Aimed at individualisation and, to a certain degree, personalisation of learning, the so-called Intelligent Adaptive Learning (IAL) has been on the rise since the beginning of the 21st century. (Malach, Kostolányová, Chmura, Nagyová, Prextová, 2016: p. 29)
- *Microlearning* – It is a good method of implementing learning in small chunks that are objective-driven and can be easily and quickly deployed within organizations. Learners benefit too as they get through the modules quickly and can repeat the learning many times as well. Retention is better, and they are less fussy about going through a boring hour-long module. Microlearning can be implemented as videos, small games, quizzes, and infographics. The great advantage of microlearning is that it can be implemented on any device. (Kumar 2018).

- *Video- and Podcasts-based learning* - Videos are one of the hottest modes of training right now. The popularity of video-based sites like YouTube has forced organizations to adopt more videos into their training. Be it Instructor-Led Training that is interspersed with anecdotal or contextual videos, or eLearning where videos play an integral part in disseminating information, videos are here to stay. The focus is on decreasing the load time and the size of videos using various tools. Video-based learning will continue to grow and will be an important trend to watch out for in the year 2019 and beyond (Own research based on Key Elearning Trends for 2019. Origin Learning (Nov 6, 2018) and <https://elearningindustry.com/elearning-trends-for-2019-8-top>).
- *Problem-based learning* – is a teaching method in which complex real-world problems are used as a vehicle to promote student learning of concepts and principles as opposed to direct presentation of facts and concepts. In addition to course content, PBL can promote the development of critical thinking skills, problem-solving abilities, and communication skills. It can also provide opportunities for working in groups, finding and evaluating research materials, and life-long learning (Duch, Groh, Allen, 2001). In PBL, the teacher acts as a facilitator and mentor, rather than a source of "solutions." (Morze, Smyrnova-Trybulska, Gladun, 2018, p. 367)
- *Project-based learning* – has been defined as “a systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic (real-life) questions and carefully designed products and tasks” (English, Kitsantas, 2013: p.130). Similarly, problem based learning has been defined as an instructional method in which students learn through facilitated problem solving that centers on a complex problem that does not have a single correct answer (Hmelo-Silver, 2004; English, Kitsantas, 2013, p. 130).
- *App-based learning* – In particular, Mobile learning applications are quickly gaining momentum.
- *Digital Storytelling* – is the practice of combining narrative with digital content, included images, sound, and video, to create a short movie, typically with a strong emotional component (Educause, 2007). Digital storytelling is a good way to engage students in both traditional and innovative ways of telling a story. The students learn how to combine some basic multimedia tools such as graphics, animation, with skills such as research, writing, presentation, technology, interview, interpersonal, problem-solving, and assessment skills (Robin, 2005; Barrett, 2005; Signes 2010).
- *Flipped Classroom* – was born in the USA and functions there under the name flipped learning or flipped classroom. The originators of this way of learning were: Salman Khan (Khan Academy) and teachers: Jon Bergman and Aaron Sams, who set the main goal for students to be more active during classes at school. In contrast to the classic lesson during which the teacher’s lecture dominates, while the students take notes, the FL method "flips" the lecture to students, thus reversing the time and manner of work (Kozik 2015: p.1). In Poland, this method was studied by K. Grzędowska, M. Rostkowska, among others, and implemented by A. Bogdańska, J.P. Sawiński (Smyrnova-Trybulska, 2018: p. 153–154).
- *Gamification and Game-Based Learning; Gamification* – Gamification is the process of using game elements, game mechanics, and game thinking to engage people, motivate action, promote learning, or solve problems. “Though commonly found in marketing strategies, it is now being implemented in educational programs as well to help educators to find the balance between achieving their objectives and catering to evolving student needs” (Dichev, Dicheva, Angelova, Agre, 2014, p.81). The problem is rooted in the traditional educational system that encourages extrinsic motivation. “Most people, although probably not completely aware of it, have experienced some type of gamification. People earn loyalty points for participating in the shopping program or a frequent flyer program. It is possible to download a fitness app for smartphone and been encouraged to create goals and track progress against those goals. People can try to improve their memory by participating in game like exercises on a regular basis. Elements of games outside of a traditional game environment motivate people to action. One way to understand gamification is to break down a familiar game into its components and elements, and mechanics, to see how these individual pieces can be applied outside of the game space” (Vygotsky, 1978).
- *Inquiry-based learning* - The term IBL is defined in several ways in the literature. First, it means the study of learning participants’ interest in a topic in which they participated in social interaction for a common understanding [11; 15]. De Jong and W. Van Joolingen (1998) defined it as an educational strategy based on the discovery of knowledge that promotes active participation and responsibility of

the student. Pedaste and Sarapuu (2006) called IBL an approach by which students solve problems using their research skills. (Morze, Smyrnova–Trybulska, Gladun, 2018, p. 368)

And others such as Bite-sized learning, Blended learning; Case-based learning.

- Blended learning - Among modern teaching methods, combined learning or mixed (or blended learning) is a leader. According to the Sloan Consortium definition, education is considered mixed if between 20% and 80% of the classes are taught remotely. In this form, the educational process combines a focused process of developing knowledge and skills through the integration of academic and extracurricular activities and the educational process using traditional teaching-learning methods, using electronic technology and remote and mobile, ensuring student self-control regardless of time, place, method and pace of learning. (Smyrnova-Trybulska, 2018, p. 252)
- Collaborative learning - Collaborative learning is meant to benefit agents of education due to the fact that it could sharpen skills in collaboration (remote collaboration) as a process of cooperation to accomplish objectives by combining mutual efforts in the dialogue and interaction to eventually obtain results for all the participants of the process. Therefore, it is important to implement collaborative techniques for classroom (virtual classroom) instruction. Quality education is supposed to be promoted and facilitated by effective collaborative communication. (Morze, Pavlova, Makhahchashvili R., Smyrnova-Trybulska E., 2016: p. 195)

4. SOME EXAMPLES AND EXPERIENCE

The distance learning platform of The Faculty of Ethnology and Sciences of Education (WEiNoE) University of Silesia, which is coordinated and administered by the author of this article, is based on the LMS MOODLE system and serves, among other things, to:

- provide support for teaching programme courses, run in the full-time and part-time mode (hybrid learning),
- prepare future teachers to take advantage of distance learning – to use e-learning in their own profession and to perform the role of a tutor,
- provide assistance with academic research and pedagogical experiments carried out by department staff, graduate students as well as post-graduate students,
- provide access to educational materials for students, the local community and all other people interested, also for the disabled, people with financial limitations, residents from small and remote towns and other users in order to give all citizens the equal chance to have access to the knowledge, as one of the main priority aims of the European Community,
- ensure the implementation of the educational, scientific projects, strengthening of international cooperation

In 2009-2010 an international project “E-learning as a road to communicating in multicultural environments” was successfully implemented with cooperation with Ostrava University (Czech Republic), Matej Bel University (Slovak Republic), co-financed by IVF (No 10920089). The international project “E-learning - as a Road to Communication in a Multicultural Environment” has successfully served the following purposes:

Popularization of E-learning in academic environments and among students through the organization of a 2-day conference (19-20.10.2009) entitled: "Theoretical and Practical Aspects of Distance Learning" with 97 participants (academic staff, teachers, students and others) and a workshop "Distance Course Design Using CLMS MOODLE" (20.10.2009) with 35 participants (as above). The participants of these activities were from all the above mentioned countries (Smyrnova-Trybulska, 2010: p. 162).

The major EU funded project pursued at the University of Silesia is called UPGOW (University as a Partner of Knowledge Economy). The project includes more than 40 reviewed open e-courses on various topics in different fields of study (<http://el.us.edu.pl/upgow>) with participation more than 35000 students. The author of the article contributed as a co-author and methodological consultant in preparing 11 distance learning courses, in which more than 7600 students took part from the University of Silesia and from outside organisations (Smyrnova-Trybulska, 2018: p. 361).

IRNet - *International Research Network for study and development of new tools and methods for advanced pedagogical science in the field of ICT instruments, e-learning and intercultural competences*. This project was financed by the European Commission under the 7th Framework Programme, within the Marie Curie Actions International Research Staff Exchange Scheme. Grant Agreement No: PIRSES-GA-2013-612536 Duration of the project: 48 months 1/01/2014 – 31/12/2017. www.irnet.us.edu.pl. The coordinator is the University of Silesia, and author of the article. The IRNet project aims to establish a thematic multidisciplinary joint exchange programme dedicated to the development of new tools for advanced pedagogical science in the field of ICT instruments, distance learning and intercultural competences in the EU, Australia, Ukraine and Russia. The programme will strengthen existing collaboration between EU partners, and 3 third country institutions of higher education through mutual secondments of researchers. The concept of the project in more detail is described in the Project application and on the project web-site (www.irnet.us.edu.pl). One of the results of the project is MOOC “ICT tools for e-learning” which was successfully developed (<http://el.us.edu.pl/irnet>). The structure of the course includes:

1. E-learning in higher education
2. ICT-tools for presentation of content and Tools for making didactic video
3. Tools for adaptive learning. Learning Styles
4. Tools for mind maps and infographics knowledge
5. Gamification in education
6. Tools for communication and collaboration
7. Tools for formative assessment and control
8. Digital Storytelling
9. ICT-tools for developing Intercultural competences in e-learning
10. Social Presence and online tutoring

During the last 2 years more than 110 users have participated in this course. Soon a version in the Edex system will be prepared. This will help the project course to reach wider audiences.

4.1 E-Learning and University's Electronic Environment

The functioning of the university's electronic environment is considered at three levels: at the *micro* level (achievement of educational goals at the level of the discipline, e-course); *meso* (solution of scientific and educational problems in the corporate environment of the university - interdisciplinary communication, cooperation, exchange of experience, macro (achievement of scientific and educational goals by inclusion in the external scientific and educational environment.).

University strategies in the field of e-learning and ICT at various levels are signalled by:

- electronic scientific and educational resources;
- network communications in the scientific and educational environment;
- framework regulations and management of scientific and educational activities in the information and educational environment of universities.

At the level of the micro- and university-level educational environment, personal competences are very important in choosing an effective learning strategy. The educational strategy in some cases determines educational environmental parameters. The student's approach to learning depends on the perception of the learning environment, which is defined as the characteristics of the environment (educational activities, resources, interactions) and personal characteristics (personal educational strategies) and learning styles (Kozielska, 2011; Kostolányová, 2013; Kostolányová, Šarmanová, Takács, 2011). In the study (Parra, Blanca, 2016) on the strategy of learning and styles as the basis for building personal learning environments (PLE), the authors formulated the conclusion that each person learns differently; their learning style strategies are influenced by the environment and resources in their possession. As a result, educational institutions can identify and share technological and pedagogical tools and strategies necessary to strengthen and build PLEs, which are more assertive and better adapted to the needs and interests of students (Parra, Blanca, 2016). (Smyrnova–Trybulska, 2018).

The concept of a Smart University in the context of global e-learning implementation includes several components:

- *Technologies* (e.g.: cloud computing technology, 3D visualization technology, Augmented Reality, Virtual Reality, Artificial intelligence and learning assistance);

- *Software systems* (e.g. Web-lecturing systems, Systems for seamless collaborative learning; *University system of study services (USOS)*);
- *Hardware/Equipment/devices* (e.g., Panoramic video cameras, SMART boards and/or interactive white boards, etc.)
- *Smart curricula* (e.g. Adaptive programs of study, Adaptive courses (with various types of teaching form: face-to-face, blended, online)
- *Students, lecturers, administration* (competent members of e-learning environment, advanced users, e.g.: Blended or fully Online, Life-long learners (retirees) in open education);
- *Smart pedagogy* (e.g. Collaborative teaching-learning, Learning-by-doing, Adaptive teaching-learning, Flipped classroom, Gamification, Problem-Based Learning, Project-Based Learning, Inquiry- Based Learning,);
- *Smart Classroom* (e.g. Smart classrooms with corresponding technologies. Software hardware systems. Smart pedagogy for smart education); (Smyrnova-Trybulska, 2018)
- *Open Source publication* (e.g., Repository (<https://rebus.us.edu.pl>), digital Library (www.ciniba.us.edu.pl), Bibliography of the work of the employee of the University of Silesia (http://biblio.bg.us.edu.pl/cgi-bin/wspd.cgi.sh/wo2_search.p?ID1=KIIMIPMINQBJHGQNBHGEDCBRIN&ln=pl))

The University of Silesia e-learning platforms provide students with more than 8,000 hours of effective work (<http://el.us.edu.pl>), The Faculty has developed a distance learning platform for training and educational activities (<http://el.us.edu.pl/weinoe>). *Distance Learning Center* of the University of Silesia provides technical support, course administration and training for teaching staff and students.

5. CONCLUSION

We have already witnessed web 3.0 as the third phase of e-learning and network evolution, characterized by a semantic approach, personalized learning, use of artificial intelligence whereby applications will be able to respond to complex requests to obtain more meaning out of the current network of connections. To respond to complex demands, an evolutionary path to *artificial intelligence* is required that will lead the user to interact with the network in an *almost human* way. The contemporary educational institutions should be open and prepared for such challenges, comprehensive changes and evolution all components of informational and educational environment.

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