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## Editorial

The EU not only provides funding, but also has launched several policy initiatives and interventions on the digitalisation of education, outlined, for instance, in “Europe 2020 Strategy,” “Digital Agenda for Europe,” “Agenda for New Skills and Jobs,” “Innovation Union,” “Opening up Education: Innovative Teaching and Learning for All through New Technologies and Open Educational Resources,” “DigComp 2.0: The Digital Competence Framework for Citizens,” “A European Framework for Digitally Competent Educational Organisations,” “A Digital Single Market Strategy for Europe,” “New Skills Agenda for Europe: Working Together to strengthen Human Capital, Employability and Competitiveness,” Digital Skills and Jobs Coalition, and “Strategic Framework – Education and Training 2020.” Furthermore, contests such as European Digital Skills Awards for outstanding projects contributing to digital skills development have been launched. The authors from ten countries try to consider and analyse the contemporary topics and modern trends in the fields of internationalisation of higher education, IT competence, and intercultural competences development in conditions of the digital world.

The present volume includes seven articles gathered in three chapters.

Chapter I is entitled “Evolution of Education, and Internationalisation of Education and Competences.” The first article – “From Socratic Behaviourism to Digital Constructivism” – was prepared by researchers from Portugal, Russia, Poland, and Ukraine: António Manuel Diogo dos Reis, Olga Yakovleva, Eugenia Smyrnova-Trybulska, and Nataliia Morze. The paper presents a synopsis of the evolution of methods and techniques up to digital age, and characterises the main aspects of behaviourist and constructivist models in order to study the development of new advanced pedagogical tools and methods in education science in constructivist environment. For the purpose of the study, an analysis of the technological evolution during the last decades and its impact on education science was made, with a special focus on virtual teaching and learning. The practical outcome of the study was a series of online seminars and workshops, prepared by the international team of the IRNet project. The keynotes and workshops were held during DLCC2017 Conference (*Theoretical and Practical Aspects of Distance Learning*, subtitle: *Effective Development of Teachers' Skills in the Area of ICT and E-learning*) at the University of Silesia in Katowice, Poland. The second article,

entitled “Internationalisation of Education and Competences Approach in the Digital World – Experts’ Opinions (A Round Table Debate Hosted by IRNet Project Researchers),” focuses on the internationalisation of education and competences approach in the digital world as viewed by experts from different countries: the Netherlands, Poland, Turkey, Russia, and Ukraine. The article aims to provide opinions, views, and reflections on important topics addressed by the IRNet project and *DLCC2017* Conference participants. The final article in Chapter I, entitled “New Technologies in Polish School: Reality and Prospects for Development,” was prepared by Polish authors Barbara Grabowska and Łukasz Kwadrans from the University of Silesia in Katowice. It presents a concise overview of activities of the Polish Ministry of National Education over the last decade or so, with a focus on the results of planned or already implemented reforms in Polish school in terms of both improving its competitiveness and taking steps aimed at teaching practical skills, and not just passing the theoretical knowledge on such topics as new technologies, usage of ICT tools as didactic aids, Internet accessibility, cyber-safety, e-textbooks, or international cooperation projects (for instance eTwinning). The article can be the base for comparison with the actions of other countries’ governments from our region. The numbers given in this text are to give only the general idea of how many more challenges there are for the governing authorities, education financing system, and the Ministry of National Education. The school does not have to encourage students to use the Internet or multimedia, but it should teach how to use them in a safe and conscious way in order to develop one’s self, qualifications, and competences.

Chapter II – “Training Models, Methods, and Means of Information Literacy Development” – includes three articles. The first manuscript in the chapter, “Training for Future Primary School Teachers to Use the Learning Apps Service in Teaching Mathematics,” prepared by Ukrainian researchers Svetlana Skvortsova and Tetiana Britskan, is devoted to the issue of the training for future primary school teachers in using information technology (IT) in teaching mathematics and, in particular, in the aspect of the use of various online resources, online services for teachers, and other kinds of pedagogical software. The results of the diagnostics of conditions of the training for future teachers for the introduction of IT at the mathematics lessons in primary school are scrutinised. The peculiarities of the digital generation of children have been determined, and, based on this, the necessity of the introduction of IT in mathematics lessons has been substantiated. The approaches to training for future teachers to create interactive exercises – in particular through the Learning Apps online service – have been identified. The next paper, “E-tutor for E-learning,” is elaborated by Andrei Fedoseev from the Federal Research Centre “Computer Science and Control” of the Russian Academy of Sciences. In the manuscript, the author describes the concept of the e-tutor providing high academic achievement in electronic and blended learning. The arrangement of the e-tutor, the instructional process features, as well as the

scheme of the whole system functioning are given; also, the concepts of a task kit and a normalised lesson are introduced. Vladyslav Bilous from Ukraine, the author of the third manuscript entitled “Requirements for Creating a Game Learning System Using Mobile Applications for Primary School Students,” focuses on the study of mobile applications for primary school students. He notes that an interest in integration of mobile applications in education will continue to rise. Such methods of studies that will facilitate and accelerate the transmission of knowledge to students, activate a process of mastering knowledge, teach them to undertake independent work with the given material, and enhance the productivity of educational process and teachers’ work are needed today. Such methods can be realised in education on the basis of the use of information technologies. What is necessary is the development of methods and resources for support of the use of mobile technologies by elementary school students. Mobile technologies can make the learning process more attractive, fulfil the requirements of today’s youth, and provide necessary information at the right time. In this model, the activity approach will be employed. The cognitive activity of a child will get organised in such a form that opens him or her for knowledge, so that learning becomes the main activity, as required by the discussed programmes. In the article, the author analyses the game models necessary for the education and development of children of elementary school age. The contents of mobile platform gaming models are revealed. The article also provides the classification of the proposed products that promote the learning and development of a child, the so-called soft skills and hard skills. The suggestions for using gaming models on different devices are given. Finally, the requirements for the use of gaming models of mobile platforms in the educational process are offered.

Chapter III entitled “Reports” includes one manuscript: “Report on the Implementation of Work Package 7 ‘Dissemination of the Project Results’ in the Framework of the IRNet Project.” This article was prepared by an international team of researchers from different scientific areas connected with ICT, e-learning, pedagogy, and other related disciplines. The text focuses on the objectives and some results of the international project IRNet ([www.irnet.us.edu.pl](http://www.irnet.us.edu.pl)). In particular, the article describes research tools, methods, and procedures of the Work Package 7 “Dissemination of the Project Results,” that is, objectives, tasks, deliverables, publications, and implementation of research trips in the context of the next stages and Work Packages of IRNet project – International Research Network.

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Evolution of Education,  
and Internationalisation of Education  
and Competences





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## **From Socratic Behaviourism to Digital Constructivism**

### **Abstract**

The paper presents a synopsis of the evolution of methods and techniques up to the digital age and characterises the main aspects of behaviourist and constructivist models in order to study the development of new advanced pedagogical tools and methods in education science in constructivist environment. For the purpose of the study, an analysis of the technological evolution during the last decades and its impact on education science was made, with a special focus on virtual teaching and learning. The practical outcome of the study was a series of online seminars and workshops, prepared by the international team of the IRNet project. The keynotes and workshops were held during *DLCC2017 Conference (Theoretical and Practical Aspects of Distance Learning, subtitle: Effective Development of Teachers' Skills in the Area of ICT and E-learning)* at the University of Silesia in Katowice, Poland. Video presentations and an automatic translation are available at: <https://areis-en-constructivism.blogspot.pt>.

**Key words:** behaviourism, constructivism, e-learning, blended learning, digital environment, IRNet

## Introduction

From Socrates and Aristotle to the end of the 19<sup>th</sup> century, methods and technology in education science environment did not change much. John Watson (1878–1958) defined the bases of a behaviourist model. The education model was based on the teacher and the teaching institution.

The technological evolution during the last seven decades has transferred a “room computer” Mark I (1943) weighting several tons into a tiny laptop, weighting less than one kilo and a thousand times more powerful than its “great grandfather.” This technological revolution was followed by enormous changes in the learning methodology: didactic tools were adjusted and the ways of their implementation altered. Nowadays, we witness information, communication, interactive, and mobile society, where civilisations are connected in real-time across the planet. This results in enormous sociologic changes in all scientific areas, particularly in education.

The social profile of our students has also changed. The average age has increased; 4 years of university basic education are just an introduction to 40 years of lifelong learning (Lima & Capituo, 2003). There is no doubt that students today are building their own knowledge. Students demand more interactivity, more multimedia content. Together with that, they are more Web dependent, surface learners, who are demanding more mobility and didactic communication in presence and distance learning. This is because they are digital constructivist, multi intelligent (Gardner, 1983), emotional behaviourist (Goleman, 1999), interactive learners (Silva, Josselyn, & Kida, 2004), and they are collaborative social virtual learners (Siemens, 2005).

All of the above results in a new way of teaching and learning, with new technologies and new methodologies. Although in the last decades a large amount of investment has been made in new technologies and methodologies, teacher skills are still short in fulfilling all educational requirements.

The questions that arise today are:

- Are we, teachers, prepared to teach in the 21<sup>st</sup> century?
- Do we have the right skills?
- What are the best technologic tools and the best methodologies?
- Is e-learning a solution? Do we need learning to be used in both presence and virtual environments?

An enormous amount of training, research, and reflections is required to answer the questions.

## Synthetic Analysis of the Technological Evolution during the Last Decades and Its Impact on Education Science

### Distance Learning Stages

We can find references to distance learning since the 18<sup>th</sup> century (Verduin & Clark, 1991), although in practice it was not used regularly until the middle of the 20<sup>th</sup> century in the USA and some European countries. The Second World War forced an important increase in distance learning because many young people incorporated in the war needed to go to the front and simultaneously many of them had to be replaced in their civil jobs with no trainers or tutors available. Moreover, when the war was finished, all the young people had to be integrated back in the professional civil activities.

In this scenario in the mid-forties Skinner started to talk about the “teaching machine” (Skinner, 1961), but in that period he did not realise what type of Pandora’s box he was opening. For the development of educational programmes, it was necessary to analyse didactic tasks and objectives. In 1956, Bloom published the conclusions of his research on “the taxonomy of educational objectives.”

On the one hand, distance learning has evolved (Moore & Kearsley, 1996) following the development of computers, multimedia, and Internet. On the other hand, technologies developed gradually in variety, complexity, and potential, offering new models of distance teaching and learning (Chute, Thompson, & Hancock, 1999).

We can name several stages of distance learning.

**The first distance learning stage (until 1970):** courses content delivered by “regular means.” At the beginning, the content and all learning materials were delivered by regular mail. Later, training courses were presented on the radio (1930) and television (1954). The pedagogic approach for this stage and the two subsequent stages was totally behaviourist.

**The second stage (1970–1980):** open universities. Although Skinner and Bloom developed their ideas in the fifties, it was only in the seventies that the theoretical bases for distance learning started to flourish, particularly as the result of the *World Conference for Distance Learning*, coordinated by Wedemeyer in 1972. Michael Moore (1973) suggested that some resources had to be developed to define the research areas, identify different types of distance learning, and build up theoretical methods. In 1969, the UK Open University was founded, and Bloom was one of the consulting advisers of this project. The UK Open University is known as one of the most relevant projects in this area and a model for many other experiences that took place all over the world during the seventies and eighties (Goleman, 1999).

**The third stage (1980–1990):** video cassettes and TV schools. The rise of video players, satellite, and cable communications enhanced the importance of TV and video communication in distance learning. The audio and image quality of the contents was very fair, and video players were offering the possibility of students to attend lessons “anytime, anywhere” and as many times as needed. Since 1985, different sets of courses were offered with a remarkable success.

**The fourth stage (1990–2000):** computers, multimedia, interactivity, e-learning. The technological evolution of digital equipment and software showed new possibilities of interactivity and improved the quality of distance learning. CD-ROMs and the Internet (1990) were two important innovative tools, offering flexible learning, allowing anyone to use virtual learning environments regardless of places or time zones. In addition, new communication systems based on the Internet started to offer the potential of interaction among students, teachers, and specialists across the world. This period marks the beginning of multimedia contents production, communication, and distribution through LMSs (Learning Management Systems). One of the most important aspects was the evidence of a need for new methodologies together with new technologies.

Some proposals in this area were presented in the early nineties:

- a) Moore and Kearsley (1996) considered the “curriculum” as a “structural” area and the constructivist “dialogue” as a need; and
- b) the “student autonomy” was highlighted as important and a “transactional distance theory” was introduced, from Dewey’s concept of “transaction,” which was later developed by Boyd and Apps.

There was a debate about the definition of distance learning. The focus was the physical separation of students and a teacher during the learning process. One of the most popular distance learning definitions produced by Moore and Kearsley (1996, p. 2) states: “planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as organizational and administrative arrangements.” However, it is also important to point out that the learning process is based on new methodologies that become effective. The use of an expanded interactivity, multimedia, graphic animation, audio, and video (stream video has been available since 1997), hypertext, communication over email, chat within “focus groups” – all these opportunities were the dream of many authors and course coordinators in that period, although they were very difficult to implement. Students started to be seen as active partners who use different technologies.

In fact, the use of this format was very limited until the middle of the first decade of the 21<sup>st</sup> century, mainly due to a short bandwidth available and its high cost. Moreover, even available technologies were often used without being supported by adequate new methodologies, and that could have turned distance learning activities into a “technological noise.” There is a final question: what is e-learning today?

## **Online Learning Environment**

In 2000, we talked about distance learning, not e-learning. However, when we talk about online learning today, are we exclusively talking about distance learning? Not necessarily! Today we can talk about distance learning supported by presence activities or presence learning supported by distance / online activities. In fact, we are in the process of constant evolution. The increasing use of online tools in presence teaching makes online tutoring a daily support tool with excellent results to improve the learning quality. What are the changes that justify that? We could see that the nineties were a critical period for a qualitative change in distance learning. Important technological evolutions, software development, and communication facilities occurred during this period. For example, very fast computers appeared, allowing video and audio editing. Moreover, hard discs, with very high capacity and rotations above 7200 rpm, were able to capture video. "Stream video" has developed since 1997 and diffused over the Internet (1990) / WWW (1991). Video projectors became available together with the software to produce audio and video contents and presentations. However, only after the Internet became available with a sufficient bandwidth and an affordable price (in the first decade of the 21<sup>st</sup> century), it was possible to start using it for education purposes. After 2000, video conference tools were available in acceptable quality and prices for education "one-to-one" or "many to many" in the format of virtual classrooms. In addition, open source LMS platforms that could be used at different education levels became available only after 2004.

## **E-learning Evolution**

Education nowadays not only covers the life period from kindergarten to postgraduate degrees, but also is understood as lifelong learning. The reasons for this are the political pressure over school results, the use of ICTs, the challenges brought by the Bologna methodology, and the common use of computers, social networks, and 3D environments. The learning theories of the digital era emphasise the importance of asynchronous interactivity, related to Web 2.0 (O'Reilly, 2005), as well as synchronous interactivity and collaborative work, inducing connectivism (Siemens, 2005). Mobility, collaborative, and informal learning are now understood as the evolution of learning processes based on technologies. In his "emotional intelligence theory," Goleman (1999) suggests the use of pedagogic games and other emotional intelligence activities to increase the learning quality. This emotional-oriented approach opens an opportunity to the use of 3D environments as eligible and valid tools for the education proposes. The experience of using Second Life and Active Worlds has shown a good potential, but revealed some didactic limitations in MUVE platforms when used in some education environments.

According to the needs of a student's profile, teachers should update their technological and methodological skills. This requires permanent training in the following areas:

- new collaborative learning methodologies;
- online tutoring, use of virtual classrooms, video conference tools, and virtual group work;
- tools to produce contents in the multimedia format, pedagogic games, use of interactive synchronous and asynchronous tools;
- use of online platforms for managing contents (LMSs) and other supporting interactive animations like 3D and MUVES; and
- formative evaluation.

Rosenberg (2001) emphasised that teaching today comprises different forms and formats: presence teaching, online teaching, virtual teaching, blended teaching, and so on. Thus, there is no sense in trying to develop the opposite terminology and make the “black and white game.” It is much more important to integrate the differences, but mainly to improve teacher skills. An interesting study ordered by the US government about online education states important rules and methodologies. Means et al. (2009) suggest that online learning is closely connected with either total or partial use of the Internet. This definition excludes printable documents and the use of TV or radio. This definition is not consistent. Some other authors use a broader definition accepting a large use of various electronic equipment – more or less what is usually called “online learning” or “e-learning” today. The e-learning definition has changed over the years and included different contents, but it has always expressed a relation between learning and the use of computers.

The first most frequent used concept was CBI (*Computer-Based Instruction*), CBT (*Computer-Based Training*), or just CBL (*Computer-Based Learning*). During the nineties, e-learning was referred to as distance learning. In 2001, Rosenberg reflected on the separation between distance learning and e-learning (2001). Rosenberg wanted to “separate waters”: on one side, distance learning supported by documents sent by post or other traditional means – not being e-learning; and on the other side, teaching and learning supported by electronic equipment and tools. Today, there is the consensus that e-learning incorporates online tools and techniques, with contents distributed in a multi-model format (printable, videos, audios, documents, etc.), and with the use of interactivity in asynchronous or synchronous modes (virtual classrooms, or in presence or distance teaching). In this regard, we can say that, due to the revolution introduced by e-learning, learning will never be as it was in the nineties, even in presence classrooms. In the beginning of the 21<sup>st</sup> century, e-learning evolved into a blended format comprising presence and distance learning, broadly called b-learning. The evolution of teaching and learning through the last decades is presented in Figures 1 and 2.



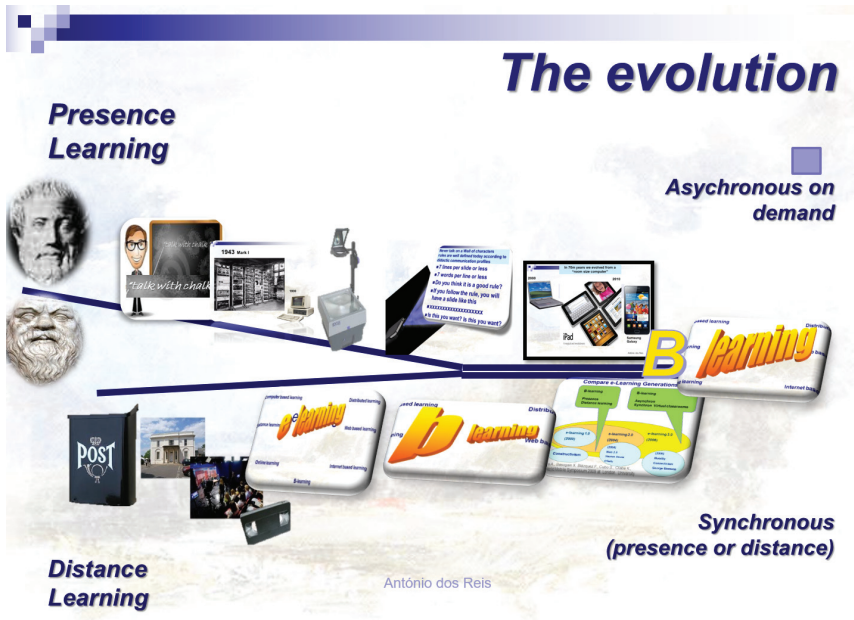


Figure 1. Evolution, part I – from Socrates behaviourism to digital constructivism.

Source: António dos Reis.

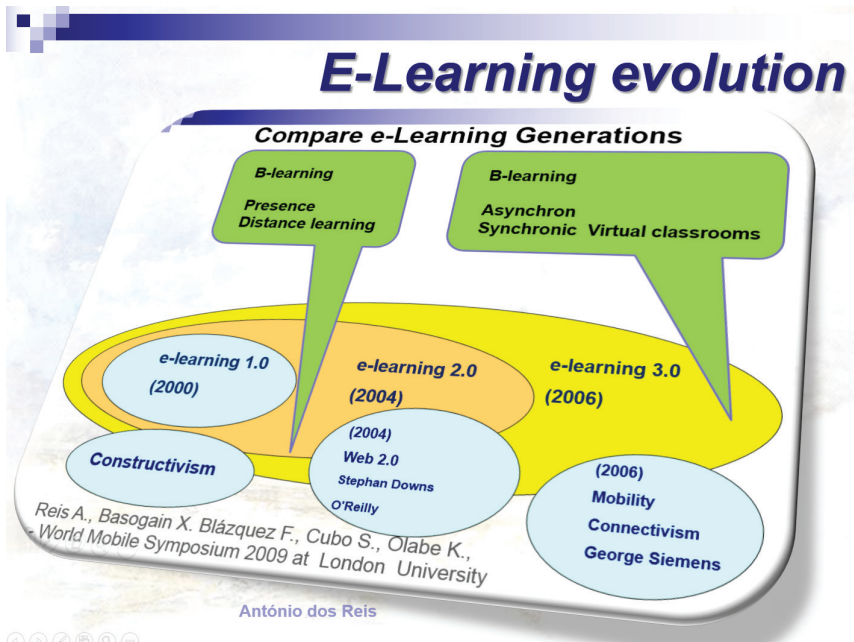


Figure 2. Evolution, part I – e-learning evolution.

Source: António dos Reis.

We can say that this was the end of distance learning in its pure format. For long duration courses, from a pedagogical point of view, it is convenient that learning is completed in a blended format: presence and distance learning. Nevertheless, in a short period, with technological improvement, particularly over increased bandwidth availability, communication and video conference software, and better teaching skills, the possibility of using virtual classrooms and synchronous activities can arise as a full alternative to presence learning. We have today contents distributed asynchronously and tutoring in presence or virtual format. This approach corresponds to Web 2.0 recommendations.

### **E-learning Stages – From E-learning 1.0 to E-learning 3.0**

During the last decade, the concept of e-learning has been changing and altering. E-learning stages can be typified in three different phases, which can be distinguished by the level of interactivity, the existence of multimedia contents, and the existence of synchronous and asynchronous online support. Today, the evolution of technology, pedagogic methodology, and teachers' skills allow us to use all the abovementioned approaches.

**The first e-learning stage – e-learning 1.0 (2000).** Courses were structured in a self-learning format and only lectured virtually (distance learning). Contents were distributed in pdf or Word prints, and no interactivity existed. At the end of the course, students normally had final presence examinations. Very quickly, students and teachers realised the limitations of this approach and a mixed solution of presence and distance learning was recommended – usually called “blended learning” or “b-learning.”

**The second e-learning stage – e-learning 2.0 (2004).** In 2004, Downes and O'Reilly started presenting their ideas about Web 2.0. Downes and O'Reilly called for a more dynamic Web and stressed the importance of interactivity with important repercussions in education environment. A major important topic was the interactivity and multimedia content in an asynchronous format: teacher–student, student–contents, and student–student. Tools available for synchronous activities like virtual classrooms or video conferences were few and very expensive, and they required quite a high bandwidth. The content was mainly distributed with the use of the following tools: forums, chats, wikis, and blogs. All of them were in an asynchronous format, and could be either integrated into LMS or not (Downes 2005, 2007; O'Reilly, 2005).

**The third e-learning stage – e-learning 3.0 (2006–).** The technological evolution, mainly related to communication tools, was a relevant factor for the third stage. Video conference and synchronous virtual classroom software started to be offered at much lower prices and required much less bandwidth. ISP (Integrated Service Provider) suppliers offer sizeable bandwidth at fair prices. Simultaneously, LMS platforms are being offered at “open source,” like Moodle, Joomla, and others. From a technological point of view, distance learning requirements are

now fulfilled in good conditions. This means that there are available asynchronous distribution and a need of communication tools for synchronous online tutoring.

Now, we are facing a new quality challenge on distance learning. It does not matter if it is called CBL, ICT, e-learning, online learning, or any other thing, technical tools are available to work with quality at any education level. Every day, better and better tools are being offered to facilitate teachers' job and students' learning. However, learning and teaching tools require more skills from teachers and students, and new methodologies. In 2007, Downes presented a new view over Web 3.0 (2007a). He claimed that web should be more effective over browsing and searching in terms of semantic and obtained results, yet the relation between his "future view" and education science was short. In 2006, we could again say that we were facing a new phase of e-learning – e-learning 3.0, which emerged from connectivism based on Siemens's approach, which includes mobility, multimedia contents, and online synchronous interactivity.

The main aspects used in this environment are:

- the use of new technologies supported by new methodologies;
- the use of LMS to distribute contents asynchronously and manage courses, in distance and presence learning;
- online synchronous tutoring support using audio, video, white boards, and other tools in virtual classrooms;
- continuous formative evaluation supported by online activities;
- the blended learning concept, which has changed from a mix of presence and distance learning into asynchronous and synchronous activities, using virtual classrooms in presence and virtual format.

The main synchronous virtual tools were virtual classrooms, e-round table, Webcast, video diffusion, e-workshop, conference call. Downes (2005) identified three stages of e-learning and associated them with Web 1.0, Web 2.0, and Web 3.0. In fact, he could establish a relation between Web phases and e-learning phases. B-learning evolves from presence and distance formats, to asynchronous on demand and synchronous in presence and online (using synchronous virtual classrooms). The formulation of e-learning 3.0 by Reis (Reis et al., 2009) is different from Downes, because he introduces a pedagogic environment and new e-learning stages, and includes several didactic tools also used in presence and distance learning.

In this way, the concept of b-learning developed on the basis of face-to-face and virtual communication, supported by asynchronous learning platforms (Moodle, Blackboard, and so on) and synchronous virtual or presence formats. All are strongly supported by multimedia content, interactivity in online tutoring, synchronous virtual classroom activities, and formative assessment.

A relevant aspect that should be pointed out is that the change from phase one into the next did not eliminate the didactics of the previous; it only introduced new didactic tools, new methodologies, and thus built a richer learning environment.

The focus is more than just technologies; it is an introduction of new methodologies and new skills to frame the educational process, to respond to a set of new needs of our students in online learning. The solution includes a set of virtual classrooms, techniques, and processes that characterise what we call “new ICT.”

## **Synthesis and Comparison of Learning Theories of Behaviourism and Cognitivism**

The theories of learning are projected in the context of the affirmation of psychology as a science in the late 19<sup>th</sup> century, the most relevant being behaviourism, cognitivism, and constructivism (Wilhelmsen, Asmul, & Meist Ad, 1999).

Behaviourism has its roots in the ideas of John B. Watson from 1913. Watson based his studies on Pavlov’s work from the nineteenth century and conditioned reflex. The work of Watson was later taken up by Skinner in the 1930s and is based on the study of the individual’s reactions to environmental stimuli where mental processes are ignored. According to Schuman (1996), new behavioural models could be accepted by repeating new types of behaviour until they become automatic. At the Funderstanding website (1998), we find a similar reading of behaviourism in stating that “it is an animal and human learning theory that focuses on observable behaviours and ignores mental activities. Behaviourist theorists define learning as the acquisition of a new behaviour.” In the behaviourist model, cognitive processes are not referred to by Briner (1999a).

Cognitivism believed that learning took place when a learner processed information and what went on inside it. This is therefore a substantially different approach from that of behaviourists, who considered a reactive and mechanical response to the stimulus. Jean Piaget began to develop this concept in the twenties, and developed most of the cognitivist theories by observing the behaviour of children.

Although the behaviourist and cognitivist approaches are distinct in terms of the process itself, both consider knowledge as an absolute and learning as the process that creates the symbolic representation of outer reality (Wilhelmsen, Asmul, & Meist Ad, 1999).

Constructivism, according to Schuman (1996), is based on the premise that we all construct our own knowledge and personal perspective of the world through our personal experience and the mental structure that we have, which is in permanent evolution.

According to Lima and Capituo (2003), there are many definitions of constructivism, but all encompass the following aspects:

- in the constructivist perspective, knowledge is actively constructed by a student and not transmitted;
- learning is both an active and a reflective process;
- a student's interpretation of the new experience is influenced by his or her previous knowledge;
- social interactions introduce multiple perspectives in learning;
- learning requires the understanding of the whole as well as the parts, and they must be understood in the context of the whole.

The essential aspect of constructivism is the construction of knowledge itself, which is relative, evolutionary, and fallible (Wilhelmsen, Asmul, & Meist Ad, 1999). The evolution of learning theories introduces substantially different approaches to the roles of a learner, a teacher, and evaluation in the learning process. The analysis of the constructivist models allows for characterising the different facets of the constructivist theory in more detail.

Teaching theory integrates a body of theoretical approaches that came throughout the 20<sup>th</sup> century, with a view to creating guidelines for the work of teachers. Snelbecker (1999) writes that teaching theories are only general guidelines for the teaching work, complemented by Reigeluth and Frick (1999), who consider it advantageous to integrate several theories and methods adapted to each of the cases in which one is working. The evolution of theoretical bases is closely linked with the evolution of different currents of teaching theory, namely behaviourism to constructivism. Boyle (1997) has introduced two main points – “Instruction” and “Constructivism.” Smith and Ragan (1999) classify as “traditional” the situations when knowledge is acquired and as “constructivist” – when knowledge is constructed. Teaching theories are commonly referred to as ID theories or instructional design. Reigeluth and Frick (1999) understand that due to the constant evolution and updating of theoretical models, the main objective will be the permanent analysis of new theories with integration and synthesis with the body of existing theories. As we have already mentioned teaching theory, it is closely related to learning theory, curriculum, and the ID process.

Constructivist knowledge environment has three steps and three levels:

1. defining rules and moulding;
2. teaching and coaching – learn and learn, and learn how to make; and
3. the scaffolding stage – the learner should build his or her own knowledge.

It creates new information and builds the student's own knowledge. According to Lima and Capitulo (2003), the evolution from behaviourism to constructivism introduces enormous changes in all aspects of the teaching and learning environment. In a pedagogic and philosophic perspective, the profile of a teaching institution, the profile of the contents, the teacher's and student's profile, and assessment are changed as well.

In behaviourist and cognitivist environment, knowledge exists in the outside world. Learning is a cognitive process not depending on the learner's profile.

The learning process is coordinated by the teacher. Learning is a sum of isolated facts, and the student's learning styles are homogeneous. In the constructivism environment, the perspective is different. Knowledge is built up by the learner and inside himself or herself. Learning is an intellectual and social process influenced by the interaction with the learner's culture and knowledge. The learning process is centred and controlled by the learner. Learning is supported by real facts. Learning is a cooperative process and group work. Learning styles are heterogeneous.

In the behaviourist and cognitivist environment, the teaching institution is static; the foundation of the teaching process is knowledge organisation, transmitting knowledge to students, and preparing students for a life career. Teaching is based on the quality and quantity of information. Yet, in the constructivist perspective, a teaching institution is a learning resource centre, preparing learners for knowledge information society and lifelong learning, preparing students to ongoing professional update and professional changes throughout their lives – teaching with a focus on quality and quantity of learning.

In the behaviourist perspective, the content as a teacher-centred activity is homogeneous with limited training and information process. In a constructivist perspective, the content is centred in the learner and in real cases, and it is personalised in content diversity and learning process; it is dynamic and with an access to large quantities of global information.

As to a teacher's profile in a behaviourist environment, a teacher is a master and the centre of knowledge. A teacher is a knowledge diffuser. In a constructivist perspective, a teacher is a learning facilitator that integrates real experiences in the learning process, and teaches how to learn, how to search, and how to select results. A teacher structures and summarises information, motivates students, promotes group work, promotes a critical perspective, and stimulates self-study capacity and the quality of analyses. In the behaviourist and cognitivist environment, the students are passive knowledge receivers; they learn other people's knowledge, assimilate information found by others, and accept knowledge diffused by others with conformism. In turn, in a constructivist perspective, students are active knowledge builders. They learn how to learn and develop their own knowledge; they learn how to work in a group for a personal result or for cooperative work; finally, they express critical thinking and might have totally different perspectives.

Assessment in behaviourism is based on tests and examinations in summative assessment perspectives. However, in the constructivist environment, the assessment has important objectives to evaluate the evolution of the student, the evolution of the teacher, and the evolution of the educational institution. The assessment has new pedagogic tools, as it continues its formative assessment evaluation diagnosis, self-assessment, group assessment, peer assessment, course assessment, and summative assessment.



Basic differences between Socratic behaviourism and constructivism are the following:

- behaviourist learners learn the master's knowledge,
- constructivist learners learn and build up their own knowledge.

## **The Practical Outcome of the Study: Seminars and Workshops, Presented at the *DLCC2017* International Conference**

In order to show the evolution of methods and techniques up to the digital age and characterise the main aspects of behaviourist and constructivist models, we prepared a series of workshops that were carried out to study the development of new advanced pedagogical tools and methods in education science, in a constructivist environment. The workshops became the practical outcome of the studies, coordinated by professor António dos Reis. The seminars and workshops were held during *DLCC2017* Conference (*Theoretical and Practical Aspects of Distance Learning*, subtitle: *Effective Development of Teachers' Skills in the Area of ICT and E-learning*) at the University of Silesia in Katowice, Poland.

The activities were prepared by the international team of the IRNet project: António Manuel Diogo dos Reis (The Graal Institute, Portugal), Olga Yakovleva (Herzen State Pedagogical University of Russia), Eugenia Smyrnova-Trybulska (University of Silesia in Katowice, Poland), Nataliia Morze (Borys Grinchenko Kyiv University, Ukraine).

The main objective of the first keynote – “Evolution part I – From Socrates Behaviourism to Digital Constructivism” – was to present a synopsis of the evolution of methods and techniques up to the digital age and characterise the main aspects of behaviourist and constructivist models in order to study the development of new advanced pedagogical tools and methods in education science in a constructivist environment (Figure 3). Consequently, the main question of the seminar was: “How has the evolution from Socrates behaviourism to digital constructivism led to a different way of teaching in the 21<sup>st</sup> century?” The video recording of the keynote is available at <https://youtu.be/rp-suGGBKWU>.

The main objective of the second keynote, “Evolution, Part II – Disruptive Innovation in the School of the Future with a Focus on ‘Flipped Classroom’,” was to show the prospects of the technological evolution with the focus on education that involves the alteration of teaching and learning methodology. The recording of the keynote is available at [https://youtu.be/g\\_FJcFe2b3g](https://youtu.be/g_FJcFe2b3g).



Figure 3. Keynote “Evolution, Part II – Disruptive Innovation in the School of the Future with a Focus on ‘Flipped Classroom’.”

Source: Own work.

## Conclusion

The research presented in this paper together with the results of the seminars and conferences are the part of the IRNet project. The results are opening the gate for important conclusions that are available in didactic videos and published papers. All the results are in free access at the IRNet website (<http://www.irnet.us.edu.pl>) and <https://goo.gl/5AU1dc> for the scientific community, researchers, and students.

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## **Od sokratejskiego behawioryzmu do cyfrowego konstruktywizmu**

### Streszczenie

Artykuł przedstawia przegląd ewolucji metod i technik nauczania aż do ery cyfrowej. Podaje charakterystykę głównych aspektów modeli behawiorystycznych oraz konstruktywistycznych w celu zbadania rozwoju nowych zaawansowanych narzędzi i metod pedagogicznych stosowanych w naukach o edukacji w środowisku konstruktywistycznym. Dla potrzeb badań dokonano analizy ewolucji technologicznej, jaka zaszła w ciągu ostatnich dekad, oraz jej wpływu na edukację, ze szczególnym uwzględnieniem wirtualnego uczenia się i nauczania. Praktycznym rezultatem badań była seria seminariów i warsztatów przeprowadzonych online, które przygotował zespół projektu IRNet. Wystąpienia i warsztaty odbyły się w ramach przeprowadzonej w 2017 roku konferencji *DLCC* (Teoretyczne i praktyczne aspekty nauczania na odległość: efektywne kształtowanie umiejętności nauczycieli w obszarach ICT oraz e-learningu).

**Słowa kluczowe:** behawioryzm, konstruktywizm, e-learning, mieszane uczenie się, środowisko cyfrowe, IRNet

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## **От сократовского бихевиоризма к цифровому конструктивизму**

### Аннотация

В статье представлен краткий обзор эволюции методов и техник вплоть до эпохи цифровых технологий, а также основные аспекты бихевиоризма и конструктивизма с целью изучения развития передовых педагогических инструментов и методов педагогической науки, в конструктивистской среде. Для целей исследования был проведен анализ технологической эволюции за последние десятилетия и ее влияния на образование с особым акцентом на виртуальном обучении и учении. Практическим результатом исследования стала серия семинаров и вебинаров, подготовленных международной командой проекта IRNet. В ходе конференции *DLCC 2017* («Теоретические и практические аспекты дистанционного обучения, подзаголовок: эффективное развитие навыков преподавателей в области ИКТ и электронного обучения») в Университете Силезии в Катовицах, Польша, были реализованы основные доклады и семинары.

**Ключевые слова:** бихевиоризм, конструктивизм, электронное обучение, смешанное обучение, цифровая среда, IRNet

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### **Del conductismo socrático al constructivismo digital**

#### Resumen

El artículo presenta una sinopsis de la evolución de métodos y técnicas hasta la era digital y caracteriza los principales aspectos de los modelos conductistas y constructivistas, para estudiar el desarrollo de nuevas herramientas y métodos pedagógicos avanzados en ciencias de la educación, en un entorno constructivista. A efectos del estudio, se realizó un análisis de la evolución tecnológica durante las últimas décadas y su impacto en Ciencias de la Educación, poniendo especial atención en la enseñanza y el aprendizaje virtual. El resultado práctico del estudio hizo posible el desarrollo de seminarios y talleres en línea, preparados por el equipo internacional del proyecto IRNet. Las conferencias magistrales y los talleres se llevaron a cabo durante la conferencia DLCC 2017 (Aspectos teóricos y prácticos del aprendizaje a distancia, subtítulo: Desarrollo efectivo de las habilidades de los docentes en el área de TIC y aprendizaje electrónico), en la Universidad de Silesia en Katowice, Polonia.

**Palabras clave:** conductismo, constructivismo, e-learning, blended learning, entorno digital, IRNet



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**Internationalisation of Education and Competences  
Approach in the Digital World – Experts’ Opinions  
(A Round Table Debate Hosted  
by IRNet Project Researchers)**

**Abstract**

The article focuses on the internationalisation of education and competences approach in the digital world as viewed by experts from different countries: the Netherlands, Poland, Turkey, Russia, and Ukraine. The article aims to provide opinions, views, and reflections on important topics addressed by the IRNet project and *DLCC2017* Conference participants.

**K e y w o r d s:** internationalisation, competences, higher education, experts, digital world

## Introduction

Digital technologies provide innovative openings to partnerships and exchanges, and pose a number of challenges, which are addressed in the 2030 Agenda for Sustainable Development. To unleash their full potential, these technologies need to be open – aiming to reduce the differences and inequalities instead of reinforcing them – and must help preserve “respect for human rights and dignity.” Thus, the development of digital literacy has become crucial for educators (Working Group on Education, 2017).

The European Union provides funding, and has launched several policy initiatives and interventions on the digitalisation of education, outlined, e.g. in “Europe 2020 Strategy,” “Digital Agenda for Europe,” “Agenda for New Skills and Jobs,” “Innovation Union,” “Opening up Education: Innovative Teaching and Learning for All through New Technologies and Open Educational Resources,” “DigComp 2.0: The Digital Competence Framework for Citizens,” “A European Framework for Digitally Competent Educational Organisations,” “A Digital Single Market Strategy for Europe,” “A New Skills Agenda for Europe: Working Together to Strengthen Human Capital, Employability and Competitiveness,” the Digital Skills and Jobs Coalition, and “Strategic Framework – Education and Training 2020.” Moreover, European Digital Skills Awards for outstanding projects contributing to digital skills development have been launched.

“Digital Agenda for Europe” contains over one hundred actions to be taken, 23 of which are the responsibility of Member States, and the rest – of the EU. The Actions fall under 7 pillars: 1) Digital Single Market; 2) Interoperability and Standards; 3) Trust and Security; 4) Very Fast Internet; 5) Research and Innovation; 6) Enhancing E-skills; 7) ICT for Social Challenges, and are reviewed on a regular basis. Different pillars contribute to the digitalisation of education, for instance:

- Action 16 – developing a code of EU online rights – pillar 1;
- Action 24 – adoption of European interoperability strategy and framework – pillar 2;
- Action 46 – obliging Member States to develop and make operational national broadband plans – pillar 4;
- Action 53 – financial support to joint ICT research infrastructures and innovation clusters – pillar 5;
- Action 54 – developing a new generation of web-based applications and services – pillar 5;
- Action 66 – compelling Member States to promote long-term e-skills and digital literacy policies – pillar 6;
- Action 68 – mainstreaming e-learning into national policies of Member States – pillar 6;

- Action 79 – developing a sustainable model for financing Europeana (European Cultural Platform for All) – pillar 7; and
- Actions 28–41 – dealing with cybersecurity – pillar 3.

“Agenda for New Skills and Jobs” promotes lifelong learning, online education, development of ICT competences, investments in education infrastructure, and support to specific teacher-training programmes.

“Opening up Education: Innovative Teaching and Learning for All through New Technologies and Open Educational Resources” proposes various actions at EU and national levels: helping institutions, teachers, and learners to acquire digital skills and upgrade learning methods; supporting development and availability of open educational resources; connecting classrooms to the Internet; and mobilising all stakeholders (teachers, learners, families, economic and social partners) to change the role of digital technologies at education institutions.

The following initiatives to promote effective digital learning have been undertaken:

- “DigComp 2.0: The Digital Competence Framework for Citizens,” launched in 2013 and upgraded in 2016; and
- “A European Framework for Digitally-competent Educational Organisations,” developed in 2015.

Drawing from the above measures, a broad set of initiatives was adopted in 2015 by “A Digital Single Market Strategy for Europe,” addressed to businesses and individuals. These initiatives aim at: building an innovation-friendly society; providing fair, open, and secure digital environment; tackling cyber security challenges; adopting new legislation for Digital Single Market, European Data Economy, online marketplace; and developing digital skills and opportunities for all.

“A New Skills Agenda for Europe: Working Together to Strengthen Human Capital, Employability and Competitiveness” augments existing initiatives and puts a noticeable focus on digital skills. It foresees increasing learning opportunities, validation of non-formal and informal learning, as well as stresses support to teachers and trainers, innovation in pedagogy, institutional collaboration, mobility, and business-education partnerships.

The Digital Skills and Jobs Coalition initiative brings together member states, companies, social partners, non-profit organisations, and education providers, who pledge to tackle the lack of digital skills in Europe and share best practices. All organisations involved in boosting digital skills in Europe can become members of the coalition by endorsing its objectives and principles laid out in the members Charter. Actions range from training unemployed people and giving MOOCs for teachers to giving coding classes to children and cutting edge training for ICT specialists. Moreover, European Digital Skills Awards for outstanding projects contributing to digital skills development have been launched. Several other initiatives in digital teaching and learning unfold under “Strategic Framework – Education and Training 2020.”

The European project IRNet aimed to study innovative forms and effective methods of education, ICT techniques, e-learning methodology, teaching competences, and effective strategies of implementing innovative educational tools in the context of globalisation of education. The objectives of the project were:

- to explore indicators of educational effectiveness in the EU and third countries involved in the project;
- to exchange experiences, to analyse and evaluate teaching competences in the use of innovative forms of education, and to suggest effective strategies of implementing innovative ICT tools in the education activity;
- to analyse and evaluate social, economic, legal, and ethical conditions, as well as methodologies and models of e-learning techniques being developed in the European and third countries involved in the project;
- to evaluate the effectiveness of the existing models/methodologies designed to provide e-learning and enhance intercultural awareness;
- to develop a new model based on the current existing models/methodologies and literature review;
- to evaluate and present new models/methodologies for effective remote collaborative work and to improve information technologies in education science in the EU and third countries;
- to actively transfer knowledge with a view to generating strategic impacts in the thematic research area; and
- to promote scientific discussion about the integrity of systems of education and work focusing on competence issues in the context of globalisation of higher education (Kommers, Smyrnova-Trybulska, Morze, Issa Tomayess, Issa Theodora, 2015).

The realisation of the research programme and the transfer of knowledge were implemented through staff exchanges between institutions in Europe (the Czech Republic, the Netherlands, Poland, Portugal, Slovakia, Spain) and third countries (Ukraine, Russia, and Australia). They have strengthened existing collaborative research and have expanded scientific contacts.

The scientific activities were divided into seven interconnected work packages, of which one WP focused on the dissemination of the results (WP7), one WP concentrated on project management (WP1), and five WPs were based on the joint research of all the partners.

The successful completion of the IRNet project provided several major outputs:

- highest quality competence in research in advanced pedagogical science in the area of e-learning, ICT, and intercultural competences with a significant influence on the development of the HEIs staff and open information, and an educational environment of a different region/country;
- ERA as an internationally-renowned partner of AU and the initiator of cooperation projects in the next Erasmus+, Cost, IVF, H2020 with an international



cooperation dimension focused on the participation of companies and development of close cooperation with outstanding EU and AU partners;

- synergy of the research, requiring an innovative education approach, and strengthening the cooperation between the EU and non-EU HEIs in the framework of an open educational electronic environment and development of SMART universities.

During the international scientific conference *Theoretical and Practical Aspects of Distance Learning: Effective Development of Teachers' Skills in the Area of ICT and E-learning (DLCC2017)*, held at the University of Silesia in Katowice, Cieszyn–Katowice, Poland on 16–17 October 2017, a round table debate with participation of the IRNet project researchers and outside experts was conducted. Experts from different countries shared their opinions on the internationalisation of education and competences approach in the digital world. The main part of the article contains some views and reflections on a number of important topics explored by the project team and the conference participants.

### **Teachers' and Learners' Digital Skills in Different Countries – Formal Regulations and Informal Approaches, Teachers' Skills and ICT Competencies in E-learning: Recommendations**

The experts participating in the round table debate agree that their countries vary in the degree of formalisation of ITC competences. The differences lie also in the variety of the applied technologies as well as in the methods of using them. According to prof. dr Iryna Sekret, such a situation is caused by factors ranging from national global educational policies to the users' personal beliefs on the place of technologies in life and in learning. Thus, international collaboration via research projects, training programmes, staff exchanges, and other forms of teaching and learning cooperation can facilitate a dialogue in this area and experience exchange. Prof. Piet Kommers stresses that according to the report “Integrating Digital Education in Adult Literacy,” one out of four adults in Europe lacks the necessary digital skills. In his opinion, literacy skills impact not only people's personal opportunities in education, employment, and community, but also the society and economy at large. The objectives are:

- to provide guidance and training for adult educators across Europe on how to use ICT tools and digital methods to deliver basic skills education;
- to explore skills needed in different contexts;
- to develop teachers' competencies;

- to share materials and teaching activities through online toolkits, workshops, and seminars; and
- to create an active European network of adult education.

There are several national regulations which aim to ensure uniform application and understanding of ICT competences. Prof. dr hab. Nataliia Morze points to the importance of the project “Digital Agenda – 2020, Conceptual Basis, Priority Areas, Initiatives, Projects of the ‘Digitization’ of Ukraine until 2020.” It emphasises the urgency of the development of citizens’ digital competence, digital citizenship, digital creativity, and digital business. A number of challenges are also tackled in the Strategy for Non-formal Education (Commercial Operators) and the Formal Education Strategy, in the Law on Education from 2017, as well as in a new educational policy, “New Ukrainian School.”

These focus on: analysis of the situation; development of lists of digital skills and competencies for individual industries; development of qualitative educational content; development and popularisation of public online and offline courses on digital literacy; measurement and certification of digital skills; harmonisation of the normative base (including the certification of teachers’ digital skills); introduction of compulsory digital competencies; and popularisation of the importance of digital literacy among citizens. According to prof. Tatiana Pavlova, the main normative acts on the use of distance education technologies and e-learning in educational programmes in Russia are: the Law on Education in the Russian Federation, Article 16; Realisation of educational programmes with the use of e-learning and distance educational technologies; Educational standards in the Russian Federation; and Professional Standard of the Teacher in the Russian Federation. They stress:

- the ability to use the means of information and communication technologies to solve cognitive, communicative, and organisational problems in compliance with the requirements of ergonomics, safety, hygiene, resource storing, legal and ethical standards, information security standards;
- skills to work with geoinformation systems;
- impact of information technology on human life in society; understanding of social, economic, political, cultural, legal, natural, ergonomic, medical, and physiological contexts of information technologies;
- ethical aspects, responsibility involved in the creation and use of information systems and dissemination of information; and
- opportunities for continuous self-education with ICT, for acquisition and integration of knowledge, communication and cooperation, effective solution of problems, self-organisation and self-regulation based on the conscious use of ICT.

In dr Iwona Mokwa-Tarnowska’s view, the Ministry of Science and Higher Education in Poland supports distance education, the only major restrictions being the limitation of its use in the curriculum of undergraduate programmes to 60% of the total number of teaching hours and the limitation of its applicability to lectures.

She also stresses that in Poland there are no formal regulations concerning ICT or pedagogic skills that tutors who want to run online courses should have. However, Polish universities provide different forms of training for their staff and students, and Association of Academic E-learning in Poland certifies the skills required of e-tutors and holds examinations on passing of which the candidate becomes AAE Certified in Online Learning Design and Development. Nevertheless, the successful completion of the examinations is not a prerequisite of being allowed to work as an online tutor.

### **The Quality of E-learning and Teachers' ICT Competences – Ways of Increasing Effectiveness**

All the experts agree with prof. Sekret that quality should be considered an urgent issue requiring attention. In her opinion, it is impacted by such factors as: the time the institution needs to join the mainstream of e-learning service providers, technological supplies, digital competences of the education stakeholders, pedagogical methodologies, and expectations and beliefs of teachers/learners. In view of these factors, the quality of e-learning should be addressed, and different approaches to evaluate the impact of e-learning on the learning outcomes should be developed. The level of the teachers' ICT competences very often reflects the demands and expectations of institutions and learners. To facilitate the development of teachers' ICT competences, institutions may take up systematic actions, e.g. intensive training programmes, motivational acts, staff exchanges, regulations, and instruction procedures. Prof. Morze enumerates additional tasks to enhance the quality of e-learning:

- development of students', teachers', and educational leaders' digital competences through development and implementation of the standard of digital competence, and development of networks for best practice exchange; and
- certification programmes for heads of educational institutions.

She also thinks that the traditional role of the teacher (broadcasting and reproduction of training materials) has been replaced by a number of new roles that involve selecting and using electronic resources, organising cooperation and communication between the participants of the educational process, designing electronic resources and electronic educational environments, facilitating the process of learning, assisting students by taking into account their needs, characteristics, and cognitive learning styles, as well as providing new services and tools for effective collaboration and communication. The new roles qualitatively change the educational environment of the modern university. Prof. Pavlova draws

attention to the ability to solve basic pedagogical tasks in an e-learning environment that teachers should have, such as:

- to “see” the students in the educational process,
- to build continuous network interactions,
- to organise interactions with other participants, and
- to design and implement professional self-education.

Dr Mokwa-Tarnowska suggests that even if university authorities recognise self-education as a sufficient way of developing knowledge and skills, and if training completion is not a prerequisite for running e-learning courses, educational programmes that will address a wide range of issues including learning design and copyright law should be made available to the staff. She stresses that inexperienced or untrained teachers can face different problems that might hinder teaching and as a result discourage them from taking on new challenges. Therefore, there should be versatile training options offered by educators and ICT specialists which will allow tutors and developers of web-enhanced, blended, and e-learning courses to see the synergy that can be gained through such education. They should specifically target the pedagogy behind teaching online as many academics tend not to understand that good teaching skills will be required to help online students develop and succeed. Prof. Kommers rounds up the discussion by raising the question of sociological aspects. In his opinion, a comparison between public and private schools will be very interesting, because most private schools permit students to bring gadgets to school, so the teaching and learning processes take place with the use of ICT. In his opinion, it will be exciting to see the findings about the effectiveness of ICT integration in public and private schools. Researchers and political agendas should be alerted to keep international education free from socio-economic stratification of today’s students’ parents; otherwise, the same gap will appear as with ICT in the schools earlier (Ghavifekr & Rosdy, 2015).

### **Innovative Specialisations and MA Programmes at Your University in the Years 2014–2017**

The experts enumerate a number of specialisms and MA courses targeting innovation in various areas:

- Information Technologies in Education; Internet of Things; Management of E-learning in the Intercultural Environment; and Development of Educational, Scientific Collaboration and Project Management with ICT Tools, an advanced training programme for university staff (Borys Grinchenko Kiyv University);

- Information Technologies in Education, Social Media, and New Education Practices, and Design and Organisation of Educational Process in the High School E-environment, an advanced training programme for university staff (Herzen State Pedagogical University of Russia).

All the educators agree that innovative ways of teaching are of utmost importance and point to their universities' achievements in this area. They also understand that there can appear different obstacles. Prof. Sekret considers Abant Izzet Baysal University to be one of the few universities in Turkey which has introduced distance learning as a constant form of education. Therefore, the university and the teaching staff prove to be open for innovations, international collaboration, and new experience. At the same time, the introduction of full international training programmes is complicated due to the differences between the educational policies among countries-partners, changing policies and regulations within the country, or a lack of knowledge about formal procedures together with considerable teacher workload. She stresses that the university academics and administration have been looking for ways to maintain international collaboration with a hope to make it as fruitful and beneficial for all stakeholders as possible. In dr Mokwa-Tarnowska's opinion, Gdańsk University of Technology also recognises the value of distant education, and although it has not introduced online degrees yet, over the past three years it has developed a wide range of specialisms, e.g. in structural engineering, sanitary engineering, waste-water plants and waste disposal, geotechnics, power engineering, green technologies, applications and Internet services, with online modules to enhance the learning experience.

## **Internationalisation of Higher Education – Present Situation and Future Plans at Your University**

The participants of the round-table debate regard internationalisation of higher education as an extremely significant process opening up new possibilities of achieving academic excellence and improved collaboration through disciplines. Prof. Kommers accentuates that Utrecht University has always encouraged international education and helps pursue learning and career opportunities. Prof. Morze emphasises her university's active cooperation with famous international organisations such as the UN, The World Bank, British Council, Alliance USETI, Research Centre "Ryan," and with such companies as Intel and Microsoft, as well as participation in a number of international projects supported by the European Commission. In prof. Sekret's view, internalisation of the education has been reinforced by Erasmus exchange programmes for students and teaching staff, and

international research projects that enable academics to develop in a number of ways. She points to an increase in the number of foreign students willing to study at her university, which in her opinion proves the growing popularity of Turkey as the country offering quality education, compatible with education in other European countries and in the USA. She also thinks that MOOCs, which her university is planning to launch, are of great potential for enhancing the internationalisation of education. They can broaden the learning community through reaching students from other distant countries. Dr Mokwa-Tarnowska looks at web-enhanced education and web-based services from another angle. In her opinion, they can help international students ease the transition to a new environment. She draws attention to the latest addition to her university's MLE called MOST (Multidisciplinary Open System Transferring Knowledge), which aims to integrate the university's VLE and the staff members' research activity, allowing free access to information about their papers, university projects, inventions, and other staff records. She stresses that now the VLE houses four compulsory online courses for all Polish and foreign students, preparing them to study at the university, and in the future its tools will be used to deliver content in both Polish and English, with a great emphasis on modules and courses that will open up education to English-speaking students.

### **From Traditional University to Open and Smart University: Suggestions and Recommendations**

The experts agree that technological advances have created a wide variety of opportunities for universities to look across borders and become more productive in offering quality education. Prof. Kommers approves the vision outlined in the Navitas Ventures report, "Digital Transformation in Higher Education." He agrees that "digitally led change is clearly underway in higher education. This initial snapshot of feedback from those involved in digital transformation is just the beginning. An ongoing program of research will provide insights to the higher education community and the edtech ecosystem. Outputs from this program of research could be used by higher education leaders as a mechanism for benchmarking objectives, approaches and progress of digital transformation efforts and as an opportunity for collaboration with peers globally. Equally, it may be helpful to edtech founders and the edtech industry to better understand the digital needs and priorities of higher education institutions and to gain further insights into the 'problems to be solved'" (2017). Prof. Pavlova points to a new Russian project called "Open Education." It is an educational platform offering online courses (MOOC) for basic disciplines studied at Russian universities, which was

created by the National Platform for Open Education association, established by leading universities. The regulatory and legal framework for the use of e-courses, obtaining credits, and taking exams is now being developed (“Order of the Ministry of Education and Science of Russia...,” 2017).

The participants of the debate also focus on how to handle the move. In prof. Morze’s view, a transition from traditional university to open and smart university should involve:

- use of relevant information to solve educational problems (the speed and volume of the flow of information in education and any professional activity are growing rapidly; existing training materials need to be supplemented with information coming in real time to prepare students to solve practical problems, to work in a real situation and not on training examples and models);
- organisation of independent cognitive research and students’ design activity (this principle is the key to prepare specialists to search for solutions to creative professional problems, independent information, and research activities);
- implementation of the educational process in a distributed learning environment (an educational environment is not limited to the campus, and it is not outside the distance learning system (LMS); training should be continuous);
- students’ interaction with the professional community (a professional is seen not only as a customer in training, but also as an active participant in the learning process; ICTs provide new opportunities for students to participate in the work of professional societies);
- flexible educational trajectory and individualised instruction (the education sector is expanding significantly by bringing working citizens into the education system, by a frequent change of professional activity, and the intensive development of technology; the university should provide educational services in accordance with students’ needs and capabilities.);
- educational activities (a variety of educational activities require the provision of opportunities for students to study and use tools in the learning process in accordance with their abilities, material conditions, and social conditions); and
- improvement of openness in the education process (the concept of openness refers to an ongoing analytics process that encompasses diversity at all four dimensions of the learning analytics reference model (Chatti, Schroeder, & Jarke, 2012)).

A smart-environment modern university must perform various functions and provide the following services:

- structuring and systematising information;
- e-learning and m-learning tools;
- diagnosis, evaluation, and monitoring of educational resources;
- self-learning management;
- virtual social network;
- media environment in classrooms;



- campus network;
- integration with scientometric databases; and
- project services, project management, development of start-ups.

According to prof. Sekret, the only prerequisite on the way of transformation is the determination of the institution to join this mainstream and to open its doors for the innovations in pedagogies, attitudes, and methods of teaching. Under the current conditions of growing competition among educational establishments and with an aim to reach the fame of the world's most reputable and recognised institutions, it is an inevitable demand to be in pace with the transformations within the current pedagogical paradigm and methods of delivering knowledge. Dr Mokwa-Tarnowska agrees with the other experts and identifies the areas to focus on to make universities smarter:

- open, flexible, and accessible quality education;
- new ways to customise the learning experience and to deliver student-centred learning;
- the Internet of Things as an opportunity to explore deeper and experiment further; and
- across university collaboration in research and educational practice supported by web technologies.

She concludes by stating that our goal should be to raise teachers' awareness of how they can benefit from web technologies that facilitate interactive information sharing and collaboration. It may result in them being more willing to make a move towards innovative web-enhanced education.

## Conclusion

“A key defining feature of current digital technologies is their networked nature. The idea of everything being connected to everything else to permit the transfer of data has introduced a ‘networking logic’ into most contemporary forms of digital technology. This logic assumes that users will be connected to other people, objects, organizations and information regardless of space, place or time. As a result, many contemporary digital technologies are built around ‘interactive’ rather than ‘broadcast’ forms of exchange, with content shared between ‘many-to-many’ rather than transmitted from ‘one-to-many’” (Jensen, 2015).



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Eugenia Smyrnova-Trybulska, Piet A. M. Kommers, Nataliia Morze, Iryna Sekret, Tatiana Pavlova, Iwona Mokwa-Tarnowska

## **Umiejdzynarodowienie podejcia nastawionego na ksztaltowanie kompetencji w edukacji w swiecie cyfrowym – opinie ekspertów (Debata prowadzona przez badaczy projektu IRNet)**

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

Autorzy artykułu koncentrują się na umiejdzynarodowieniu edukacji oraz podejciu opartym na ksztaltowaniu kompetencji w edukacji w swiecie cyfrowym. Omówione zostają różne spojrzenia na problem zaprezentowany przez ekspertów z Holandii, Polski, Turcji, Rosji oraz Ukrainy. Celem artykułu jest przedstawienie poglądów, opinii oraz refleksji na ważne tematy, do których odnieśli się uczestnicy projektu IRNet oraz konferencji *DLCC 2017*.

**Słowa kluczowe:** umiędzynarodowienie, kompetencje, szkolnictwo wyższe, eksperci, świat cyfrowy

Eugenia Smyrnova-Trybulska, Piet A. M. Kommers, Nataliai Morze, Iryna Sekret, Tatiana Pavlova, Iwona Mokwa-Tarnowska

**Интернационализация образования и компетентностный подход  
в цифровом мире - мнения экспертов  
(дискуссии за круглым столом, проведенным исследователями проекта IRNet)**

**Аннотация**

В статье основное внимание уделяется интернационализации и компетентностному подходу в области образования в цифровом мире, в соответствии с мнениями экспертов из разных стран: Нидерландов, Польши, Турции, России и Украины. Целью статьи является предоставление мнений и размышлений по важным темам, рассматриваемым проектом IRNet и участниками конференции DLCC2017.

**Ключевые слова:** Интернационализация, Компетенции, Высшее образование, Эксперты, Цифровой мир

Eugenia Smyrnova-Trybulska, Piet A. M. Kommers, Nataliai Morze, Iryna Sekret, Tatiana Pavlova, Iwona Mokwa-Tarnowska

**El enfoque de la internacionalización de la educación  
y las competencias en el mundo digital: opiniones de expertos  
(debate en mesa redonda organizado por investigadores del proyecto IRNet)**

**Resumen**

Este artículo se centra en la internacionalización de la educación y la enseñanza por competencias en el mundo digital según expertos de diferentes países: los Países Bajos, Polonia, Turquía, Rusia y Ucrania. El objetivo del artículo es proporcionar opiniones, puntos de vista y reflexiones sobre temas significativos abordados por el proyecto IRNet y los participantes de la conferencia DLCC2017.

**Palabras clave:** internacionalización, competencias, educación superior, expertos, mundo digital



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## **New Technologies in Polish School: Reality and Prospects for Development**

### **Abstract**

The text presents a short overview of activities of the Polish Ministry of National Education over the last dozen years or so, with a particular focus on the activities that are the results of planned or already implemented reforms in Polish school in terms of both improving its competitiveness and taking practical steps aimed at teaching practical skills, and not just providing the theoretical knowledge on such topics as new technologies, usage of ICT tools as didactic aids, Internet accessibility, cyber-safety, e-textbooks, or international cooperation projects (for instance eTwinning). The article can function as the base for comparison with the actions of other countries' governments from our region in this field. The numbers given in this text are to give only the general idea of how many more challenges there are for the governing authorities, education financing system, and the Ministry of National Education. The school does not have to encourage students to use the Internet or multimedia, but it should teach how to use them in a safe and conscious way in order to develop one's self, qualifications, and competences.

**Key words:** Poland, school, new technologies, Internet, cyber-safety, e-textbooks, eTwinning

## Introduction

In the second half of the 20<sup>th</sup> century, the ideas about education were shaped by the directions of global changes: the knowledge and Information and Technology (IT) revolution, demographic revolution, revolution of simultaneous globalisation and localism, technological revolution, ecological revolution, aesthetical revolution, axiological revolution, political revolution (Dalin & Rust, 1996, in: Kwieciński, 2000, pp. 392–394). In the recent decades, a special meaning has been given to the IT revolution, which results in social changes and in socialisation of next generations, whose evolution and growth, and their own developmental crises overlap external crises.

Regarding the IT revolution, the experts were stipulating that the new media should lead to numerous significant changes in our lives, culture, and customs. They were making hypotheses about vanishing of direct interpersonal contacts. Bearing in mind that those changes are not instant, but they should be perceived as a process, some of the changes could be noticed already after several years since the opportunity of accessing the Internet arose in our country. In the 1990s, Alexander King and Bertrand Schneider were “certain that we are at the early stage of creation of a new type of global society, so different from the today’s one, just as the society created by the industrial revolution was different from the long agricultural period’s society preceding it” (1992, p. 21). The revolution of knowledge and IT led to perceiving knowledge as a form of capital. If we follow Zbigniew Kwieciński’s idea that “education means all actions, processes, and conditions that are favourable to people’s development, and the development is described, among the others, by better understanding one’s self and relations with the world, more efficient control of one’s own behaviours, and greater perpetration in external processes” (2000, p. 233), then teachers are facing a great challenge. They should help students meet the challenges of the information society. In a society respecting the rules of democracy, pluralism, and tolerance – and, above all, in the information society – education should serve not so much the state as the citizens, and especially each individual separately.

This text aims at being just an overview, that is, a presentation of actions of the Polish Ministry of National Education over the last ten years or so, with a particular focus on the activities being the results of reforms of Polish school (which are either already planned or still in the phase of implementing) in terms of improving its competitiveness and implementing practical skills, and not just providing the theoretical knowledge on such topics as new technologies, usage of ICT tools as didactic aids, Internet accessibility, cyber-safety, e-textbooks, and international cooperation projects, like eTwinning. Eugenia Smyrnova-Trybulska (2018) analyses and comments on many domestic and foreign documents, and describes the theoretical and practical aspects of the application of ICT in

contemporary education at various levels. The existing research covers only the state or the application level of new technologies at schools, and the expectations accompanying it. Definitely, after completing even the first stages of the reform, it will be possible to design the evaluation research. Therefore, here we would like to present the overview of activities managing Polish education in terms of using new technologies. This article may be used as a base for comparison with the activities of other governments of countries from our region in this topic (Smyrnova-Trybulska, 2009, 2017). To an extent, the text might seem to be too reporting, but for a foreign reader, it should serve as a source of knowledge about the recent reforms pertaining to using new technologies at schools.

### **The Beginning and the Aftermath of the Information and Technology Revolution in Polish School**

Introducing new technologies in schools is a multi-faceted matter. Any changes are initiated by the Ministry of National Education. The 1999 reform of the educational system brought many changes, also in the department of implementing new technologies. Schools were introduced to the educational path of media and readership education, while the higher education level added the Media in Education course to pedagogical studies.

The Ministry of National Education devised strategies pertaining to implementation of information and communication technologies (ICT) at schools. A nationwide technology infrastructure – National Educational Network – was created, and its task was to monitor educational services connected with new technologies. The next step was constituting the National Educational Portal, and properly selecting educational platforms and learning environments.

Optimisation of educational processes, which are to be supported by computerisation, takes place on several grounds. The most important among them are: computer and methodological software, technological and organisational structure – i.e. equipment, multimedia, lessons' organisation, and proper preparation of teachers. Implementation of new technologies at schools depends on those indicators, deciding on the educational programme.

From 2012 to 2013 (over a one-year period), a governmental programme of developing competences of students and teachers in terms of using ICT – “Digital school” – was realised. The programme included four *e-components*:

- e-school: equipping over 400 schools with the necessary ICT infrastructure, i.e. modern educational tools;

- e-student: providing students from those schools with an access to the modern educational tools at home;
- e-teacher: developing teachers' skills in the field of using ICT during lessons; and
- e-educational resources / free of charge e-textbooks: access to public, educational, electronic resources.

The year-long “Digital school” programme in the selected schools did not transform into a nationwide project. In reality, most schools lacked the access to broadband Internet, multimedia boards, and IT classrooms. Lessons with new technologies were limited almost completely to computer science classes. As a result, in the PISA 2012 test of solving problems with the usage of the computer (“programming” a ticket machine or an air-conditioner), junior secondary school students got bad results – the 29<sup>th</sup> place among 32 countries. However, there were also exceptions; let us refer to Polish students reaching the 4<sup>th</sup> place in the all-time medal table ranking of International Olympiad in Informatics – they won 101 medals, while China collected 111, taking the 1<sup>st</sup> place.

## **New Solutions and the Educational Reform**

The programme of digitalisation of Polish schools was revisited on 1 September 2016. A pilot programme of teaching programming was launched in schools. The skill of programming became a part of common computer education.

The undertaken actions had their enshrinement in the Act on Education. Article 1 section 18 stipulates “development of students’ entrepreneurial and creative attitude [...] through using, in the educational process, innovative programme and methodological solutions,” while in section 21 “popularising knowledge about safety and teaching right attitude towards dangers – including those connected with using ICT, and unusual situations – to children and teenagers was considered.” In section 22, “fostering the ability of using ICT efficiently has been added” (“Ustawa z dnia 14 grudnia...”).

“School is to provide the students with conditions for gaining knowledge and skills needed for solving problems, with the use of methods and techniques based on informatics, including logical and algorithmic thinking, programming, using computer applications, searching for and using information from various sources, using computer and basic digital equipment, and students should employ those skills during lessons from various subjects, among others, in working with texts, doing calculations, processing information and presenting it under different forms” (“Podstawa programowa wychowania przedszkolnego...,” p. 15). Importantly enough, the assumption was made not only to teach IT skills, but also “to prepare

students for making informed and responsible choices while using sources available on the Internet, forming critical analysis of information, safe moving about the digital space, including creating and maintaining relationships with other Internet users that are based on mutual respect” (“Podstawa programowa wychowania przedszkolnego...,” p. 15).

Therefore, as Tadeusz Lewowicki states, the doctrine of the adaptive education (education consolidating the hitherto typical models of social life, blocking changes, preparing new generations for the stagnating reality) needs to be replaced by the doctrine of critical-creative education (1994, p. 17), stimulating innovation, creativity, and changes of the surrounding world. In the process of school education, the main focus should be on shaping a critical attitude towards contents on the Internet, making the youth aware of the dangers of surfing the cyberspace. Among the objectives of education, the primary issues should revolve around shaping *attitudes, skills/efficiencies, and information*. We need to take care of the specific quality of people who characterise themselves with openness, imagination, capacity for everlasting self-education and intellectual autonomy, creativity and initiative, an ability to think, and cooperation on a global scale. Thus sorted reflection leads to “transformative education,” which prepares children and teenagers for transforming the world (Lewowicki, 1994, p. 26).

## Programming

In the framework of fundamental trends in educational policy of the country, in school year 2016/2017 the Ministry of National Education assumed the development of computer competences of children and teenagers in schools and institutions. Five elements were established:

1. pilot: programming,
2. coordinators in educational offices: for innovations in education,
3. Council for IT Education: designing a tested core curriculum for the subjects of Computer Studies,
4. website: [programowanie.men.gov.pl](http://programowanie.men.gov.pl), and
5. recommendations: guidelines for equipment.

Programming teaches particularly logical thinking and precise presentation of thoughts and ideas, but also good work organisation while solving problems and development of competences needed for cooperation which are necessary today in almost every profession. After a year-long pilot for formal education on every level of schooling, conducted in over 2000 schools, teaching of programming was introduced.



Programming in the core curriculum is understood in a much broader sense than just writing a programme in a programming language. “It is a whole process, IT centred attitude to solving a problem: from specifying the problem (determining data and results, or more generally – aims of solving the problem), to finding and designing a solution, to programming the solution, testing its reliability, and – if need be – making corrections with properly chosen application or programming language” (“Podstawa programowa kształcenia ogólnego...,” p. 10). The new computer studies core curriculum covers learning since the first grade of primary school. 280 hours are dedicated for computer studies lessons (apart from grades 1–3). The correlation of computer studies with other subjects has also been taken under consideration.

In 2016, in every province, a post of the coordinator for innovation in education was established. Their task is to supervise and monitor the actions on the level of their province, in the framework of the pilot programme of teaching programming. The programme was planned basing on educational innovations in selected schools at all levels of education since 1 September 2016. Additionally, among the coordinators’ responsibilities, there are tasks resulting from implementing the governmental plan for responsible development. Apart from teaching programming, there are issues connected with supporting schools in implementing the actions and solutions using ICT providing added educational value, e.g. usage of e-textbooks and e-resources, implementing e-Register, and effective educational methods of activating students (“Powołanie wojewódzkich koordynatorów...”).

The implementation of programming into the core curriculum of formal education requires additional skills from the teachers. At the leading stage of the pilot programme, an educational and informational campaign was being conducted, in the framework of which, during the second half of 2016, 159 training conferences were organised with 13,290 computer studies and early education teachers participating. The conferences were also conducted in 2017. Additionally, there was a series of training courses for teachers about programming. Departments of education, teacher training institutions, and Foundation for the Development of the Education System offer their support in the form of training courses. Teachers can get grants for developing curriculum under Measure 3.2 “Innovative solutions for digital activation” of Operational Programme Digital Poland. EU funding provided 124,211,127.00 PLN for this purpose.

Methodological support for teachers-advisors and methodical advisors is organised by the Education Development Centre and Teacher Training Centres, but also by publishers of textbooks for early schooling. Among others, Wydawnictwo Mac [Mac Publishing House] and the New Face of Education Association prepared free training courses about programming for teachers of grades 1–3 of primary school. Many universities have prepared programming courses for teachers of grades 1–3, unfortunately for a fee. During trainings, workshops, and courses,

teachers are prepared for shaping attitudes and skills, which are key to computer-based thinking with children, which is sometimes called algorithmic thinking.

## **The Internet and Its Accessibility**

A necessary element of teaching programming is connecting each school to broadband Internet. This task is being accomplished together by the Ministry of National Education and the Ministry of Digital Affairs; it is also financed with EU funding from Operational Programme Digital Poland. A complex net connecting all educational institutions where students of age 6 to 19 are taught is going to be created.

The Computer and Media Education Council worked since June 2008. Their main task was to organise and support educational activities which were to help create an information society. The council was also to give opinions about projects of the Ministry of National Education and propose new solutions for teaching computer science and information technologies, and also how to use these solutions in teaching other subjects (“Rada ds. edukacji informatycznej...”). The experts who are members of the Council were working on the document “New Technologies in Education.” In September 2010, Standards for preparing teachers in Information and Communication Technology were published. The Council for Computerisation of Education’s works resulted in accepting the document created by Maciej M. Sysło: “Directions of development of technology supported education. New technologies in education. Proposal of the strategy and the plan of action for years 2014–2020” (Sysło). It is a “vision” of education supported with technology. The Council for Computerisation of Education supervises the works of digitalisation of education, preparing teachers of IT education and computer studies for primary schools and post-primary schools.

Execution of computer studies classes and learning programming are enriched by electronic resources on many Internet portals, such as [programowanie.men.gov.pl](http://programowanie.men.gov.pl).

## **E-textbooks**

The last of the listed elements of a digital school are educational e-resources. The state budget has funds planned for realisation of many actions for creating new resources, development of e-textbooks, development of open sources on the Scholaris portal, starting the School of Practice (the pilot of the first school),

and also the works on e-resources for art subjects, multimedia resources for foreign languages for business. The leading role in these endeavours is kept by the Education Development Centre. The first electronic textbooks were presented in September 2013, and were accepted enthusiastically. In 2017, students could already use 62 free e-textbooks, available on the website [www.epodreczniki.pl](http://www.epodreczniki.pl), and other educational resources accessible on the websites of school textbooks publishers.

The publishers and technology companies offer a wide range of solutions in the field of e-textbooks. This variety is the result of many interpretations of the concept of an e-textbook, but also of the differences in understanding the needs of teachers or in broader understanding of the educational market. It is considered that e-textbooks should meet the following criteria: “multimedia – understood as providing the textbook with multimedia elements, e.g. films, animations, simulations; interactivity – understood as providing the textbook with elements allowing for active work with them, e.g. interactive quizzes, experiments giving interactive results; availability on different devices – understood as a possibility of opening the e-textbook or/and its fragments on devices such as a computer, a laptop, a notebook, a tablet, or an interactive whiteboard; the possibility of printing the whole or the fragments of the e-textbook – understood as the possibility of printing any part of the e-textbook, chosen by the teacher; coordination with an e-learning platform – understood as the possibility of uploading the e-textbook onto an e-learning platform, which leads to the access to the information about using both the whole textbook and its parts; coordination with educational and/or social portals – understood as accessibility of the e-textbook at the level of an educational portal in any place and at any time, with the possibility of extending the textbook with additional resources, for example links to the latest developments in the given fields, as well as with social channels for communication; correlation with the traditional textbook – understood as curricular (content) concurrence with the traditional textbook functioning in paper form; possibility of doing exercises – understood as doing exercises and self-control tests by oneself from the level of the e-textbook; navigation – possibility of using page-by-page or free navigation throughout the textbook; and possibility of composing own textbook content – understood as the ability of creating own teaching materials, using resources available in the e-textbook, for any part of the curriculum, for example lessons” (Plebańska, p. 10).

A governmental programme of developing school infrastructure and competences of students and teachers in the field of ICT also includes equipping public and private primary schools and art schools in Poland and abroad (Polish schools abroad and schools with Polish as the teaching language) with interactive whiteboards, projectors, speakers, and interactive touch screens. Under the three-year governmental programme, approximately 15,580 public and private primary schools and art schools in Poland and abroad will be given teaching aids.

## Safety in Cyberspace, Safety at School

An important element of actions in education is the implementation of programmes which are designed to promote solutions using cyberspace resources in Polish schools in a safe way. In the framework of the project [Cyfrowobezpiecni.pl](http://Cyfrowobezpiecni.pl) – *Bezpieczna Szkoła Cyfrowa* [Safe Digital School], information, educational, and consultative support will be ultimately provided to 2,200 primary, junior secondary, and secondary schools, including 165,000 pupils, 220,000 parents, and 22,000 teachers. The programme shall run until 2018 in the framework of the governmental programme *Bezpieczna+* [Safe+]. The authors of the programme rightly stress that the basic element of digital safety at schools is knowledge and awareness of pupils – but also of teachers and parents – about the possible dangers and risks related with using the Internet and modern digital tools. The [Cyfrowobezpiecni.pl](http://Cyfrowobezpiecni.pl) project was created to address the problems and challenges of the safe use of the resources from the cyberspace in Polish schools. In the course of the project, the implementers pay special attention to encourage the school headmasters, teachers, and parents to an activity in the field of prevention and encouraging students to a responsible behaviour online. Systemic solutions have been proposed which will allow for a better use of digital tools for supporting the development of students, with simultaneous assurance of children's safety and teaching them the rules of using the Internet and digital devices wisely. Among the actions in the framework of the project's implementation we can list School Digital Safety Days, educational and informative events in schools which are conducted by educators in the form of workshops with students and meetings with teachers and parents (a total of 2,200 of those events will be organised). Since September 2016, those actions have been implemented in primary, junior secondary, secondary, and vocational schools. Additionally, a contest "We Are Cybersafe!" (3 editions) was organised, in which schools from the whole country could take part, organising original lessons about cyber safety. The prizes were mobile digital workrooms, educational camps for students, and for the particularly involved teachers – participation in summer Educamps. A consultation point for headmasters, teachers, and parents has also been established, where, via Internet and telephone, one may get answers for any questions pertaining to digital safety in a school environment. National Convents of Safe School were also organised (3 editions: October/November 2016, 2017, and 2018); these were two-day meetings with, among others, representatives of Ministry of National Education (MEN), and experts in the field of digital safety from scientific institutions and police. It is also hard to overestimate the trainings for 2,200 School Mentors for Cyber Safety: teachers who gain organised knowledge, which is helpful in coordinating actions for ensuring cyber safety in their schools. [Cyfrowobezpiecni.pl](http://Cyfrowobezpiecni.pl) portal has been created – it is an informative, educational, and promotion platform, realised in the model of a social portal,

dedicated to all groups related with the topic of digital safety in schools. A package of educational materials, reference books, scenarios, e-learning courses, educational games, and multimedia with open-source licences for teachers and educators has been prepared as well. The *Cyfrowobezpieczni.pl* project is co-funded by MEN in the framework of a public task “competence improvement of school staff, students and their parents in the field of safe using the cyberspace and reacting to dangers.”

In 2016, another stage of “Cybernauci – kompleksowy projekt kształtowania bezpiecznych zachowań w sieci” [“Cybernauts – A comprehensive project for shaping safe behaviour online”] was realised. It is a training programme whose goal is raising the level of safety while using the Internet by children, youth, their parents, caregivers, and teachers. The project will have been finished by the end of 2018. The implementer is the Modern Poland foundation with the partnership of Collegium Civitas. The main activity of the project is conducting the workshops with students, parents, and teachers of schools at all levels from Poland. The aim of the project is raising the level of safety of using the Internet by children and teenagers, but also by the parents, caregivers, and teachers. Conducting workshops in schools countrywide for all target groups will contribute to accomplishing the goal. Additionally, complementary materials have been prepared, with all recipients in mind. In the supported schools, well-prepared coaches lead workshops for students, their parents, and teachers. Participation in the project is free of charge. In the framework of the project, a catalogue of publicly-available educational materials about safe using ICT and the cyber-safety has been published. The catalogue helps with easy search of the materials according to the described metadata, which include, among others, recipients of the materials, thematic scope, licences. The tool is intended for searching materials pertaining the topic of online safety. The project is financed by the Ministry of National Education. The project is held under the honorary patronage of Ministry of Digitalisation, the Ombudsman for Children Marek Michalak, and the Education Development Centre.

## **Instead of the End**

New technologies in education in Polish schools are not a modern challenge anymore, but they have become a reality of the educational process. The numerical data indicated in the text give only the idea of how many more challenges there are before the governing authorities, the system of financing education, or the Ministry of National Education. For certain, there is no need to convince anyone of the legitimacy of using ICT – this is the emerging reality. Children and youth deal more often with new technologies outside of the school, and they get new skills there. The school does not have to promote the usage of the Internet or

multimedia, but it should teach how to be a safe and well-informed user, who develops one's self, qualifications, and competences. The future is drawn by the ambitious plans, projects, and reforms indicated in the text. Soon, their evaluation and modifications – depending on the results and drawn conclusions – will be needed.

What seems to be highly topical as well is the commitment in actions pertaining to the fight against bullying online. Cyberbullying (electronic bullying) or stalking are modern forms of bullying among kids: stalking, intimidation, harassment, ridiculing others with the means of the Internet and electronic devices e.g. texts, e-mails, websites, discussion forums, social websites, and so on. It is important for the whole school community to have the knowledge about the typology of cyberbullying, its forms, basic information from the studies on this phenomenon, the possible prevention, diagnosing, counteracting, working with students, and legal responsibility (Pyżalski, 2012, p. 318).

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Barbara Grabowska, Łukasz Kwadrans

## Nowe technologie w szkole polskiej: rzeczywistość i perspektywy rozwoju

### Streszczenie

Tekst prezentuje krótki przegląd działalności polskiego Ministerstwa Edukacji Narodowej w ciągu ostatnich dwunastu lat. Szczególna uwaga poświęcona zostaje działaniom, które są rezultatem planowanych i już wprowadzonych reform w polskich szkołach w celu poprawy ich zdolności do współzawodnictwa z innymi szkołami, a także wykonania praktycznych kroków w kierunku nauczania umiejętności praktycznych, a nie prostego przekazywania wiedzy teoretycznej z zakresu nowych technologii, wykorzystania narzędzi ICT jako pomocy dydaktycznych, dostępu do Internetu, bezpieczeństwa w sieci elektronicznych podręczników oraz projektów współpracy międzynarodowej, takich jak eTwinning. Artykuł może stać się punktem odniesienia dla porównania z działaniami podejmowanymi w tym zakresie przez rządy innych krajów. Liczby przytoczone w artykule dają tylko ogólne pojęcie o tym, jak wiele wyzwań staje przed rządzącymi, systemem finansowania edukacji oraz Ministerstwem Edukacji Narodowej. Szkoła nie ma obowiązku zachęcać uczniów do wykorzystywania Internetu i multimedów, ale powinna nauczać, jak ich świadomie i bezpiecznie używać, aby uczniowie rozwinęli się jako osoby oraz zwiększyli swoje kwalifikacje i kompetencje.

Sł o w a k l u c z o w e: Polska, nowe technologie, Internet, bezpieczeństwo w sieci, e-podręczniki, eTwinning

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### **Новые технологии в польской школе: реальность и перспективы развития**

#### **Аннотация**

В тексте представлен краткий обзор деятельности Министерства образования Польши в течение последних десяти лет с особым вниманием к мероприятиям, которые являются результатом запланированных или уже реализованных реформ для польской школы с точки зрения повышения ее конкурентоспособности, реализации преподавания практических навыков, а не просто передачи теоретических знаний в области новых технологий, использования инструментов ИКТ в качестве дидактических средств, доступности в Интернете, кибербезопасности, электронным учебникам, проектам международного сотрудничества, таким как eTwinning. Эта статья может быть основой для сравнения с действиями правительств других стран в данном направлении. Цифры, приведенные в этом тексте, должны дать только общее представление о том, сколько еще существует проблем для руководящих органов, системы финансирования образования, отдела образования. Школа не должна поощрять использование Интернет или мультимедиа, но она должна научить, как использовать их безопасным и сознательным образом для развития личности, квалификации и компетенций.

**Ключевые слова:** Польша, школа, новые технологии, Интернет, кибербезопасность, электронные учебники, eTwinning

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### **Nuevas tecnologías en el sistema educativo polaco: realidad y perspectivas de desarrollo**

#### **Resumen**

El artículo presenta brevemente la actividad del Ministerio de Educación Nacional polaco a lo largo de los últimos doce años. Dedicar una atención especial a estas acciones que son efecto de las reformas planeadas o realizadas ya en los centros de educación polacos con el objetivo de mejorar su capacidad de competir con otros centros, y, asimismo, de tomar medidas bien definidas para enseñar competencias prácticas, y no solo transmitir conocimientos teóricos acerca de nuevas tecnologías, uso de las TIC como herramienta auxiliar en la enseñanza, seguridad en la red, manuales electrónicos y proyectos de colaboración internacional como eTwinning. El artículo puede convertirse en un punto de referencia para comparación con las actividades desarrolladas en este campo por los gobiernos de otros países de la región. Las cifras citadas dan solo una idea general sobre la multitud de retos que enfrentan los gobernantes, el sistema de financiamiento de la educación y el Ministerio de Educación Nacional. El sistema educativo no tiene obligación de animar a los alumnos a usar Internet y multimedia, pero debe enseñar como servirse de ellos conscientemente y sin peligro, para que los estudiantes puedan desarrollarse y aumentar sus habilidades y competencias.

**Palabras clave:** Polonia, nuevas tecnologías, Internet, seguridad en la red, manuales electrónicos, eTwinning





Training Models, Methods, and Means  
of Information Literacy Development





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## **Training for Future Primary School Teachers to Use the Learning Apps Service in Teaching Mathematics**

### **Abstract**

The article investigates the problem of future primary school teachers' training in using information technology (IT) in teaching mathematics and, in particular, in the aspect of the use of various online resources, online services for teachers, and other pedagogical software. The results of the diagnosis of conditions for future teachers' training for the introduction of IT at the mathematics lessons in primary school are analysed. The peculiarities of the digital generation of children are determined, and, based on this, the necessity of the introduction of IT in mathematics lessons is substantiated. Finally, the approaches to training for future teachers to create interactive exercises – in particular through the Learning Apps online service – are identified.

**Keywords:** information technologies, training for future teachers, online services Learning Apps, interactive exercises

## Introduction

The main feature of the modern stage of development of the education system of Ukraine is its integration into the European educational space, which involves the harmonisation of national educational standards with international ones, based on a competent approach in education and envisaging the acquisition of key competences by future specialists. The list of the eight key competences outlined in the Recommendations of the European Parliament and the Council of Europe of 12 December 2006 also includes information competence.

The current notion of information competence or of information and digital competence is the term “digital competence,” which includes the confident, critical, and responsible use of and interaction with digital technologies for learning, work, and life in society (“Proposal for a Council Recommendation on Key Competences for Lifelong Learning...,” 2018). The term “digital competence” has been applied in the updated edition of key competences for lifelong learning approved by the European Parliament and the EU Council in 2018. Therefore, approaches to the formation of information and communication (digital) competence of teachers are in the field of interest of international organisations (UNESCO, Organization for Economic Cooperation and Development, Eurydice educational networks, European Schoolnet, etc.). The researchers have also focused their attention on the rebuilding of training courses in order to effectively capture future IT teachers in line with the current level of information society development. And this is logical, as representatives of the new digital generation, or “kids of Google,” have come to school – these are children born after 2010, in the era of digital technologies and wireless communication. They are surrounded by computers, laptops, tablets, smartphones, and game consoles, and they are simultaneously in the two worlds – both real and virtual, because they cannot imagine their existence without gadgets and connection to the Internet. Modern children are much better than their grandmothers and grandfathers – they work with mobile phones and tablets; they intuitively handle a web search, finding the right cartoons, games, and more, and even trying to learn from online sources on their own. A quick search on the Internet for a lot of information is a feature of modern junior schoolchildren, which is lacking in previous generations.

The interaction of children with IT from an early age directly affects the formation and development of their higher mental functions. Neurophysiologists have found that gadgets, on the one hand, provide quick access to information that requires a certain level of development of cognitive processes for its processing and, on the other hand, have a negative effect on the quality of memory, attention, and information processing in pupils.

Psychological peculiarities of junior schoolchildren – representatives of the digital generation – were the subject of research conducted in the laboratory of

psychodiagnostics of the GS Kostyuk Institute of Psychology of the National Academy of Educational Sciences of Ukraine (Goncharenko, Vavrik, & Vereshchak, 2014). Larysa Kondratenko and Lidiia Manilova found that, on the one hand, the feature of students of the digital generation is saturation of information and, on the other hand, there is a constant need for new information, which, unfortunately, they do not try to analyse or memorise.

Scientists note that cognitive processes of the representatives of the digital generation are worse than in previous generations (Bezrukih, 2003, p. 2). The deterioration of memory is due to the fact that students do not need to store information, including learning, because “Google knows everything.” In modern junior pupils, there is a decrease in the volume of auditory memory, so it is much more difficult for them to learn poetry and rules by heart. Relying on the work of Daniel Wegner, the psychologist Betty Sparrow of Columbia University suggests that the Internet has become a special form of memory, that is, transactional memory (Sparrow, Liu, & Wegner, 2011). Representatives of the digital generation do not remember the information they need, but the one they can reach.

Fast flipping of electronic pages, or “computer surfing” (Kim et al., 2010), not perceiving large texts, scanning the first, middle, and final lines of the text, wishing to quickly find out the basic idea without trying to resort to logical processing of the text, rapid switching from one source to another – all these negatively affect the quality of attention and information processing since a person is not accustomed to concentrating on and deeply analysing information.

Another feature of modern children is “clip thinking.” Werner Heisenberg, quoted by Marshall McLuhan, notes that “the far-reaching changes in our environment and in our way of life wrought by this technical age have also changed dangerously our ways of thinking, and that here lie the roots of the crises which have shaken our times” (McLuhan, 1962, p. 29). Such thinking is characterised by the use of visual images or associations of different kinds. One of the signs of clip thinking is linguistic minimalism: verbal expression of thoughts is minimised, with a virtually complete substitution of speech by schemes, drawings, and symbols. An example of such communication of modern children is the reflection of thoughts with the help of smilies.

Modern junior schoolchildren are accustomed to a continuous stream of information, and start to get bored when it is not sufficient or it is given very slowly and in a standard way. The digital generation of children is a multitasking generation that has the inherent ability to perform two or more actions simultaneously, but this multitasking is imaginary since the child’s brain is not focused on any of them.

Electronic pages, video games, and cartoons offer children a bright, dynamic image and special effects. The brain of the child gets used to high levels of stimulation, which traditional training cannot provide, so it seems uninteresting to students. Teachers are observing that traditional methods of teaching are not working as effectively as before; also, parents turn to the authors of textbooks with

a request to create an electronic textbook because the child is willing to perform tasks submitted electronically.

It becomes apparent that the digital education model for children should be tailored to take into account pupils' capabilities and needs, which requires updating IT-based learning tools and techniques. In order to meet the students' need for action in the virtual world, it is necessary to change learning tools by including electronic applications such as interactive tasks created on the learningapps.org platform. Obviously, in order to do so, teachers themselves need to know IT well, but usually the teachers of modern-day children of the digital generation are representatives of non-digital generations.

Consequently, there is a need for the training of primary school teachers to use electronic learning tools in the learning process. Analyses of scientific sources on the use of IT in the educational process of general education institutions (Myroslav Zhaldak, Dominika Żezługa, Natalia Morse, Dana Orszagová, Eugenia Smyrnova-Trybulska, etc.), and on creation and use of computer training programmes, electronic textbooks, manuals, presentation and testing programmes (Martin Drlík, Peter Švec, Júlia Tomanová, Martin Cápaj, Oksana Kravchuk, Luibov Petukhov, etc.) testify that in the scientific plane a foundation has been created for the development of a methodology for the preparation of future teachers. Meanwhile, this problem has remained inadequate in terms of the use of various online resources, online services for elementary school teachers, and other pedagogical software tools in the process of teaching junior pupils of mathematics.

## **Theoretical and Practical Principles of the Training of Future Primary School Teachers to Use IT in Mathematics Education**

IT has become an integral part of the training of future professionals in higher education institutions, creating an informational educational environment that includes software that combines teachers and students. It contains a database, educational content, a discussion forum, a test repository, and a student login system (Smyrnova-Trybulska et al., 2017).

The analysis of the concepts of “information technology,” “information technology in education,” “information technology training,” “computer technology,” “new information technologies,” and “new information technologies in education” is given in the works of Svitlana Skvortsova and Marina Haran (Skvortsova & Haran, 2015). The authors state that the most common notion in this list is the notion of “information technology” and emphasise the possibility of using it to refer to

any of the above concepts. In our study, we use the term “information technology” and, following Myroslav Zhaldak (Zhaldak, 2005), we interpret it as a collection of methods and technical means for the collection, organisation, storage, processing, transmission, and presentation of data that increase the level of knowledge of people and develop their capabilities in the management of technical and social processes.

Thus, following the definition of information technology by Zhaldak, we consider *the training of future primary school teachers to use information technology in the process of teaching mathematics pupils* to be one of the components of methodological training, the purpose of which is to prepare them for the use of various online resources, online services for teachers, and other pedagogical software in their professional activities.

Methodical training is carried out in the process of mastering the discipline “Methodology of teaching mathematics” by future teachers of primary school and during the pedagogical practice. Yet, as shown in the analysis of the programmes of the course of this discipline, carried out during the staging experiment in 2012–2014 in 12 universities of Ukraine by Skvortsova and Haran, there are significant differences in the content of this discipline, but the common point is that the application of information technology in the process of teaching younger students of mathematics is not the subject of separate consideration (Skvortsova & Haran, 2015).

Meanwhile, the peculiarities of modern children, who are representatives of the digital generation, and world trends in the development of education indicate the need to include the use of various online resources, online services for teachers, and other pedagogical software tools to the content of methodological training. Benchmarks for ICT teacher training curricula are developed by the Netherlands scientists Paul Kirschner, Iwan Wopereis, and Peter Van den Dool, and one of the areas is the consideration of ICT as a means of learning. The researchers emphasise that teachers need to acquire competencies in adapting technology to more effective teaching, planning individual and group activities, preparing and creating teaching materials using ICT, etc. (Kirschner, Wopereis, & Van den Dool, 2002).

In Poland in 2003, the IT Teacher Training Standard was adopted; it defines the tasks and specifics of the preparation of different groups of teachers for the introduction of IT, depending on the specialty and the educational stage they are working on. In the majority of European countries, as well as in Australia, Canada, and other countries, standards for information and communication competences of future teachers have already been adopted.

An interesting project for our study is the Continuing Professional Development Initiative for Immigrant Teachers to Use IT in Ireland, developed by the National Centre for Technology in Education. It is built on a three-stage approach: from basic skills, through professional skills, to the development of pedagogical skills (National Centre for Technology in Education, 2008).

Therefore, the use of IT is necessary for the effective professional activity of the primary school teacher. Today, IT provides the teacher with an opportunity

to create interactive exercises, tests, quizzes, and educational games on their own with the help of various online resources, services, and other pedagogical software. For example, there are online services for creating tests and quizzes of various formats: Moodle, Google Forms, Webanketa, Online Test Pad, GoConqr, PlayBuzz, Baamboozle, to name a few. The teacher can use such mobile services as Kahoot!, Triventy, Socrative, or Quizalize to develop educational tests and quizzes on mathematics. The teacher can create educational and game exercises on various subjects using the following online services: ProProfs, Purpose Games, H5P, Flippitty, Learning Apps, etc.

At this time, there are quite a few online services (for instance [https://www.google.com/intl/ru\\_ua/forms/about/](https://www.google.com/intl/ru_ua/forms/about/), <http://pochatkowa.blogspot.com/>, <https://ru.padlet.com/>, <http://en.linoit.com/>, <https://thisissand.com/>, <https://www.classroomscreen.com/>) addressed to the teacher, and in particular to the elementary school teacher. These services allow the teacher to create educational content, taking into account the peculiarities of the students of the digital generation.

## **Diagnosis of the State of Preparation of Future Teachers for the Introduction of IT at Mathematics Lessons in Primary School**

Experimental work was carried out on the basis of South Ukrainian National Pedagogical University named after K. D. Ushynsky and Izmail State University of Humanities. The pilot questionnaire was attended by 100 3<sup>rd</sup> year full-time students of the specialty 013 Primary Education. The experimental research consisted of the following stages: stage I – demonstrating the interactive exercises created on the Learning Apps to students; stage II – familiarising students with the possibilities of the Learning Apps service and the algorithm of working with it; stage III – practical training for students to create interactive exercises on different platforms of the Learning Apps service; stage IV – creating individual projects.

Since the definition of the level of development of skills in the use of IT is not the subject of the mentioned experimental research, we confined ourselves to the students' self-esteem. To diagnose the basic skills and skills that will be used in the process of preparing future teachers for the introduction of IT in mathematics lessons in primary school, we have developed an appropriate questionnaire with different types of questions. The questions of the developed questionnaire also gathered general data on respondents and on certain practical skills.

One of the questions in the questionnaire asked students to evaluate their IT skills on a five-point scale, where 5 – excellent, 4 – good, 3 – satisfactory, 2 –



sufficient, and 1 – unsatisfactory. As a result of the analysis of questionnaires, we have established that all students have a computer with the Internet connection and have experience in using information technology in their teaching activities. Most students can work with e-mail and programmes to work with different types of documents (texts, spreadsheets, presentations) in the Microsoft Office suite. What has been revealed as significantly worse are self-assessments of students’ abilities to work in professional online networks and to create websites. The results of the study are presented in Figure 1.

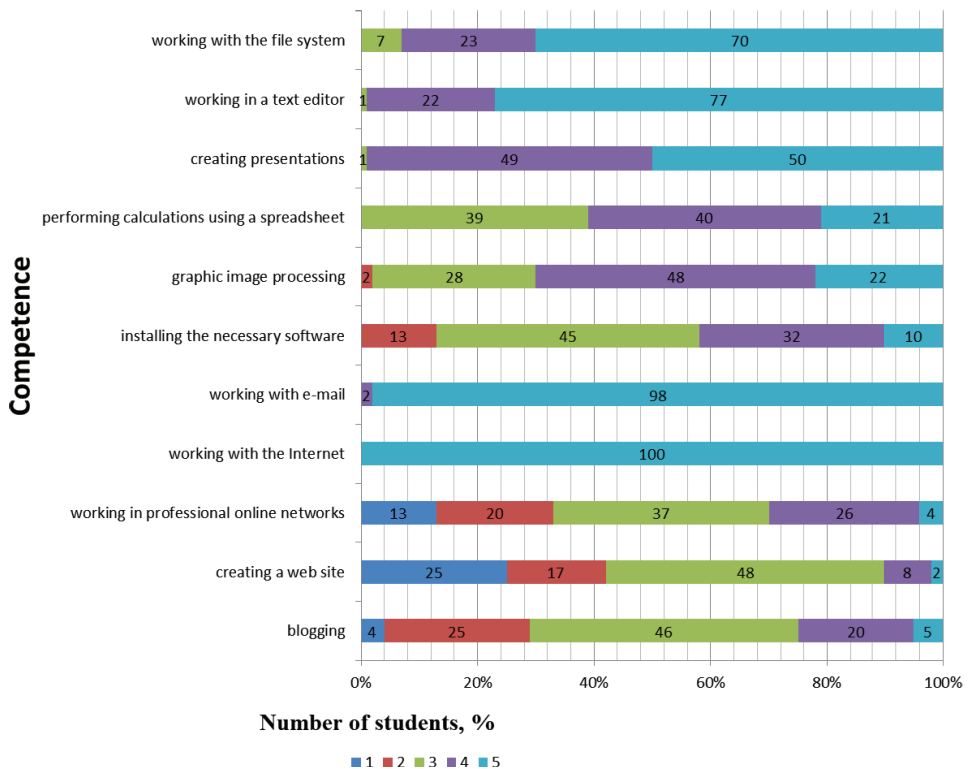


Figure 1. Self-assessment by students of the level of knowledge of information technologies.

Source: Own work.

Analysing the answers to this questionnaire, one can conclude that students have basic knowledge and IT skills acquired during the process of studying at school and at a higher education institution.

At the same time, we were interested in the issue of the orientation of future teachers on the use of IT in professional activities. It should be noted that before the experiment, students had the experience of using multimedia presentations at the lectures on methods of teaching mathematics, using information provided on

special Internet sites, in social groups, on YouTube, etc., in order to master this discipline.

Before starting to experiment with the Learning Apps online service and learning how to work with it, students were asked to identify which uses of IT tools they considered appropriate in primary school mathematics education, in the form of an open question: “What Web resources do you use for teaching materials?” Responding to it, the students listed the following: <https://skvor.info/>, <http://www.yrok.net.ua/>, <http://ru.osvita.ua/>, <http://begin-english.ru/>, <https://www.youtube.com>, and other sites. However, for the professional training of a future teacher, this list of Web-resources is rather limited.

We were also interested in the understanding of the need for future teachers to use IT in the training of modern junior pupils. 97 students think that it is beneficial to use educational games, 94 – multimedia presentations, 91 – interactive exercises, 85 – educational videos and audio recordings, 73 – training programmes, 40 – tests and quizzes. Consequently, most students agree that it is necessary to introduce IT in the education of modern-day pupils.

Concerning the use of various gadgets for junior school pupils in mathematics, 68 students consider it expedient to use them (smartphones, tablets, electronic books). However, with regard to working with special didactic technical means of teaching, we should note that most students are not aware of the opportunities of working with them, and therefore do not have the appropriate skills and experience with them (for instance, with the interactive whiteboard). 88 students claim that they have never used the interactive whiteboard in educational activities, and this is logical, since many Ukrainian educational institutions do not have the opportunity to purchase this expensive equipment.

Despite the fact that students did not have the skills to work with IT-based learning tools, it is pleasing that most students expressed their willingness to participate in creating interactive exercises using the Learning Apps (96%).

The results of our study indicate that students have basic knowledge, skills, IT skills, and readiness to improve them and, in particular, to learn how to create interactive exercises with the Learning Apps service.

## **Preparing Future Primary School Teachers to Create Interactive Mathematics Exercises Using Learning Apps**

### **Learning Apps as a Tool for Teaching Mathematics to Junior Schoolchildren**

The Internet network attracts teachers with their information resources and services. The most popular at this stage are Web 2.0 social services. Web 2.0 generally covers the services that allow users to generate content themselves, as

well as to distribute it using tapes and hyperlinks. The user chooses which content he or she should get on the go, set up for reading selected blogs, community participation, etc. (“So take Web?...” 2009).

LearningApps.org is one of the Web 2.0 services to support learning that makes it easy to create online interactive exercises. Its purpose is to create a public library of independent blocks, suitable for reuse and editing (Hielscher, 2012).

In order to create interactive exercises on the Learning Apps service, the teacher needs to go to <https://learningapps.org/>, register, and link his or her account with the email in case of password recovery. Opening the service, the user immediately finds the menu of the site – a list of hyperlinks to its sections: “View Exercises,” “Creating Exercises,” “My Classes,” and “My Exercises.” Depending on its purpose, the teacher chooses the desired section. By opening the section “Review of Exercises,” one has an opportunity to see a collection of exercises that are distributed at the level (depending on the age-old features of the education curriculum: pre-school, primary, secondary, high school, and postgraduate education) and categories (study subjects: English, mathematics, computer science, art, etc.).

When we choose the “Creating Exercises” section, the service introduces us to a collection of platforms through which we can create interactive exercises, such as: find a couple, classification, numeric line, simple ordering, free text response, image snippets, quiz, and fill in the gaps. In addition to the abovementioned platforms, the service also contains templates for creating interactive games and quizzes, collections of exercises, audio and video content, exercises such as the first million, puzzles, crosswords, find on map, find the words, where is it?, guess the word, horse racing, game of the couple, calculate.

Learning Apps provides great opportunities for a primary school teacher to create interactive math exercises. Interactive exercises can cover all sections of the initial course of mathematics – the numbering of non-negative integers and ordinary fractions, arithmetic operations of addition, subtraction, multiplication, and division with integers, magnitudes, plot mathematical problems, as well as algebraic and geometric propaedeutic.

When studying the numbering of natural numbers and regular correct fractions, it will be best to use interactive exercises performed using the “Easy Ordering” platform, which includes an analysis of proposed objects (figures, numbers, etc.) and the establishment of a certain sequence of their placement (Skvortsova & Onoprienko, 2017, p. 70). To create an exercise of this type, one needs to choose the appropriate platform. Next, the service offers one to familiarise with three examples of exercises of this type: if the user likes a certain exercise, then he or she has the opportunity to create his her own exercise on its basis, replacing only the necessary values. One can also skip this step and select the “create new exercise” function; the user fills the platform by entering the necessary data: he or she gives the name (Exercise 1) and the description of the task (Place the figures with the numbers in the order of their growth). The next step is to specify the items

that will be placed in the specified order. Depending on the number of items, one fills out the appropriate number of cards with the required information (it may be text, images, voice over, audio, and video) and indicates the order of their location (from \_\_ to \_\_) (Figure 2). One must also choose the way in which elements are displayed (free, upright, or horizontally). The final step is to write a feedback text that will appear when the correct solution is found, as well as writing the text for the prompts. Next, one completes the editing and goes over to it (Figure 3). If everything turns out as planned, one saves the exercise, and if there are certain disadvantages, then one returns to its editing.

Figure 2. Filling in the “Easy Ordering” platform for Learning Apps.

Source: Own work.

By creating an exercise on the platform, the teacher can modify it: he or she can change the task of placing pictures with numbers in descending order or replace numbers.

In studying the numbering of the first ten numbers, the task (Skvortsova & Onoprienko, 2017, p. 9) is executed on the “Numerical Line” platform, in which it is necessary to correlate the number of objects shown in the figures to the corresponding number (Figure 4).



Figure 3. This interactive exercise was created using the “Easy Ordering” platform of the Learning Apps.

Source: Own work.

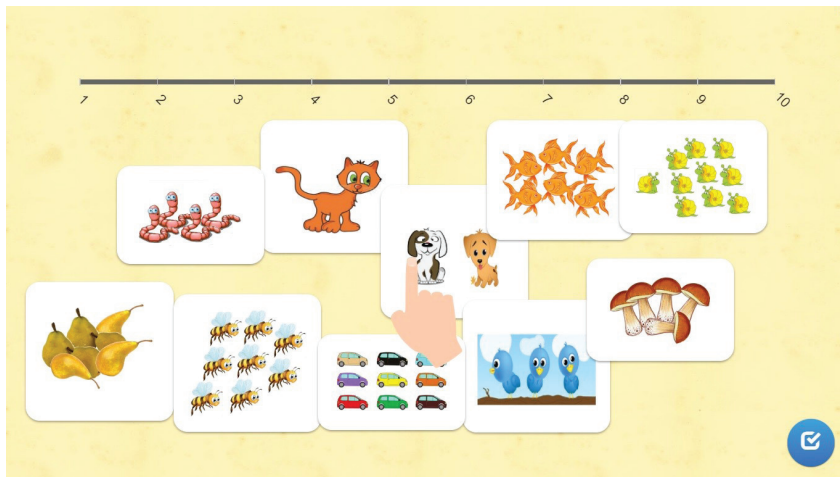


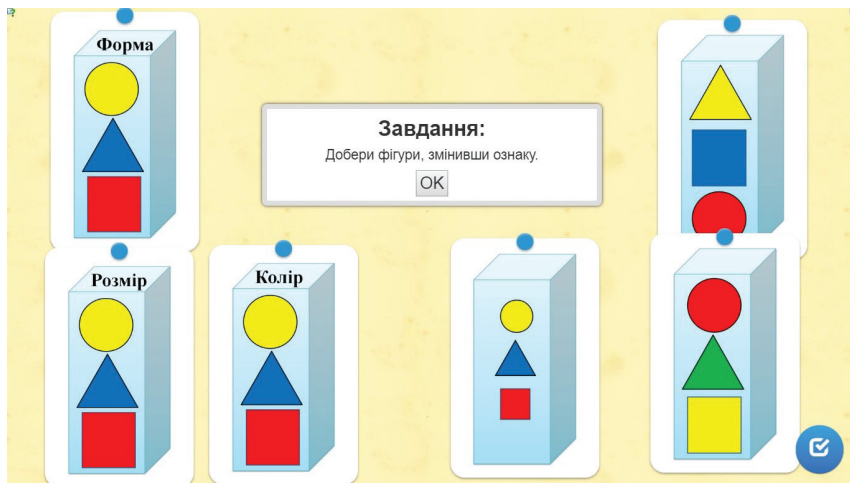
Figure 4. This interactive exercise was created using the “Numerical Line” platform of the Learning Apps.

Source: Own work.

If a student wishes to do it, he or she must first explore the pictures depicted on the screen and count the number of objects. Then the student correlates the number of depicted objects in the figures with the corresponding numbers, denoted by a numerical line. As soon as the child touches the drawing, a line joining the figure with the number appears. These actions must be performed with all the cards, and only then can the student click on the “check” button.

Similar tasks are feasible for junior schoolchildren, as 6- and 7-year-old children are characterised by effective visual differentiation as they have developed visual perception (Bezrukih, 2011).

To implement algebraic and geometric propaedeutics, it will be best to use interactive exercises created on the “Find a Couple” platform. In order to create the abovementioned kind of exercise, it is necessary to select several pairs of two objects that correspond to each other, that is, they have a certain property. For the development of critical thinking of junior schoolchildren, the teacher has the opportunity to add superfluous elements that do not have a pair. For example, in the study of geometric figures, it will be effective to use interactive exercises in which students must explore all the geometric figures depicted on the screen and combine them into pairs on a common basis (Figure 5) (Skvortsova & Onoprienko, 2017, p. 6).



*Figure 5.* This interactive exercise was created using the Learning Pair: Find a Couple platform.

Source: Own work.

Each interactive exercise created on the Learning Apps service has its own QR code, whereby a teacher can get a quick access to what he or she needs. In order to perform interactive exercises, it is enough for the teacher to place the QR code on any level surface (to be designed on a board or to print on a sheet of paper), while students with special programmes installed (QR QR-barcode scanner, Smart Scan – QR & Barcode Scanner Free, QR Droid Code Scanner, etc.) need to scan the code and they will instantly access the exercise the teacher offers. The use of interactive exercises with QR codes allows the teacher to diversify the learning process, organise non-standard maths lessons (lesson-quest, lesson-quiz, etc.), and, as a result, increase the interest of junior pupils in learning mathematics.

Note that besides creating interactive exercises, the Learning Apps service enables the teacher to create a virtual classroom, manage student accounts, choose a set of exercises for each class, and control their execution.

### **Approaches to Teaching Future Teachers to Create Interactive Exercises with Learning Apps**

The analysis of neuroscience data on the development of cognitive processes in junior pupils, the Google Generation, suggests that in order to effectively educate modern children, we need to take their needs and opportunities into account; therefore, the search for IT-based learning tools is relevant. On the other hand, according to the results of the study, future teachers are aware of the need for new IT-based learning tools and they are willing to use them. However, in the course of studying the methodology of teaching mathematics, in none of 52 universities of Ukraine do the course programmes envisage the issue of IT-based learning tools.

It should be noted that future primary school teachers study disciplines that are the basis for learning IT-based maths training. These are, first of all, fundamentals of informatics, technical means of education, new information technologies, methodology for the application of computer technologies in the teaching of school course objects, and others. Therefore, in the course of teaching the methods of teaching mathematics, it is necessary, on the one hand, to demonstrate the practical use of IT both in lectures and in practical classes, and, on the other hand, to actively involve students in mastering modern means of teaching mathematics for junior pupils. To solve this problem, the teacher needs to combine the explanation of the methodological material with the IT capabilities and, in particular, to demonstrate the capabilities of the Learning Apps service for creating interactive maths exercises.

The purpose of the experimental work is to prepare future teachers of elementary school to use the Learning Apps service in the process of teaching mathematics of pupils of grades 1–4. At the first stage of the study, we demonstrated to the students the ready interactive exercises created in this service; students mastered working with them as users. The second step was to familiarise students with the capabilities of the Learning Apps service and the algorithm for working with it. During the conducted experiment, a lecture session was held on the topic “Creating interactive exercises for the teaching of mathematics of junior pupils using the Learning Apps service.”

The third phase of the experimental work involved the practical training to create interactive exercises on various platforms of the Learning Apps service: “Find a Couple,” “Classification,” “Numerical Straight,” “Simple Ordering,” “Free Text Response,” “Fragments of Image,” “Quiz,” and “Fill in the Gaps.” At practical and laboratory classes, students under the guidance of a teacher gained the ability to create interactive exercises. To this end, we developed an algorithm for creating interactive exercises using the Learning Apps service: 1) select a task



from a textbook or tutorial; 2) develop a methodology of work on tasks, observing the methodological approaches studied; 3) choose an appropriate platform; 4) design the possible actions when performing the task; 5) develop an algorithm for the student to perform the task; 6) make an instruction for the student; 7) create a comfortable student interface task; and 8) make a bright, interesting shell task for children.

Most students quickly and easily mastered the technique of creating interactive exercises in the Learning Apps service: they acquired the knowledge and ability to fill existing platforms by template. In the first lesson, some students encountered the difficulty of transferring an exercise from a textbook or a notebook to the Learning Apps service, that is, they could not pick up the platform for the exercise or chose the least appropriate of all. Students easily overcame these difficulties after getting acquainted with the peculiarities of each platform's work.

At the fourth stage, future teachers had to apply the acquired knowledge and skills of using the Learning Apps service while performing individual projects – their own interactive mathematical exercises for students in grades 1–4 according to syllabuses (Skvortsova & Onoprienko, 2017). Most students (92%) coped with this task and created their own collection of interactive maths exercises for elementary students. 27% of students created an insufficient number of exercises, did all the exercises on the same platform, picked up the wrong platform, or filled it only with text information. 40% of students created all selected exercises technically correct, but the appearance of these exercises was not attractive and standard. 25% of the students came up creatively with interactive exercises, using their own images created in Paint or in PowerPoint. Some students proved that one can create interesting exercises with the same task using different platforms.

Individual projects performed by students were evaluated according to the following criteria: methodological, technical, and aesthetic. Indicators of the methodological criterion were the correctness of the methodological design of the task, the completeness of observance of the guiding basis of action, the clarity of the instruction for the implementation of the task for children, the ability to perform actions with the elements of the task. The technical criterion was characterised by the following indicators: optimality of the choice of the platform for the task implementation, correctness of settings, dynamism. The indicators of the aesthetic criterion were: external attractiveness (brightness, curiosity and contemporaneity of pictures, location on the plane of the task elements), observance of the colour gamut which causes positive emotions in children, sound support (use of pleasant sound signals, musical accompaniment, etc.).

Determining the above indicators of methodological and technical criteria made it possible to characterise the levels of development of interactive tasks using the Learning Apps service:

- low: there is fragmentary knowledge and ability to create interactive exercises with the help of a teacher;



- average: the student has certain theoretical knowledge about the service and is able to perform the practice according to the model;
- sufficient: the student knows the features of each platform and is able to create standard exercises using images, and audio and video clips; and
- high: the student knowledge is a deep, strong system; the future teacher is able to apply this knowledge for non-standard creation of exercises and self-development.

Therefore, it is necessary for the teacher of the methods of teaching mathematics course, on the one hand, to demonstrate the practical use of IT in lectures and in practical classes, and, on the other hand, to actively involve students in mastering modern means of teaching mathematics for junior pupils.

Basing on student self-assessment (Figure 6), it can be argued that almost all students acquired the knowledge and skills to create interactive exercises in the Learning Apps service; only 8% demonstrated a low level of interactive skills with the use of Learning Apps (Figure 6). This situation can be explained by the fact that these students were absent at most classes, gaining knowledge and skills in creating interactive exercises in the framework of an individual schedule, or that they did not have a desire to gain these skills on their own.

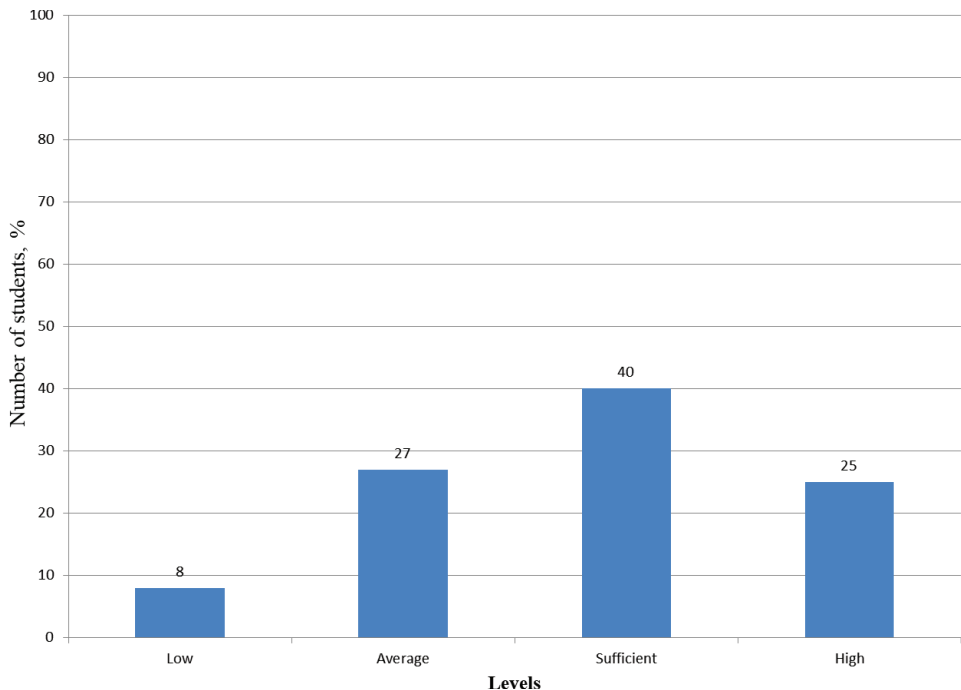


Figure 6. Results of an evaluation of interactive exercises created by students using the Learning Apps service.

Source: Own work.

## Conclusion

The introduction of IT in the teaching of mathematics of modern junior pupils means changes in the system of training future teachers. When preparing for future professional activities, students must be aware of the means by which they can organise student learning activities.

In the course of experimental work, the state of preparation for the use of IT by future teachers of primary school was researched. It has been found that most students have basic knowledge, skills, IT skills, and readiness to improve them and, in particular, to learn how to create interactive exercises with the Learning Apps service.

We have developed a system for preparing students to create interactive exercises using the Learning Apps service, which includes the following steps: demonstration of the finished interactive exercises, familiarisation with the capabilities of the Learning Apps service and the algorithm of working with them, practical training to create interactive exercises on various platforms of the service, students' performance individual projects. As a result of the experimental training, 92% of students mastered the ability to create interactive exercises with the help of Learning Apps.

We see prospects for further research in the creation of a bank of interactive exercises in mathematics; we wish to acquaint future primary school teachers with other online resources and online learning services for mathematics, namely Moodle, Google Forms, Webanketa, Online Test Pad, GoConqr, PlayBuzz, Baamboozle, Kahoot!, Triventy, Socrative, Quizalize, ProProfs, Purpose Games, H5P, Flippitty, and so on.

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Svetlana Skvortsova, Tetiana Britskan

### **Kształcenie kandydatów na nauczycieli szkół podstawowych do wykorzystania aplikacji Learning Apps w nauczaniu matematyki**

#### **Streszczenie**

Artykuł jest poświęcony zbadaniu problemu przygotowania kandydatów na nauczycieli szkół podstawowych do wykorzystania technologii informacyjnej (IT) w nauczaniu matematyki, szczególnie w zakresie stosowania dostępnych online zasobów i usług dla nauczycieli oraz oprogramowania edukacyjnego. Dokonano analizy rezultatów diagnozy warunków kształcenia przyszłych nauczycieli

pod względem wprowadzania technologii informacyjnych na lekcjach matematyki w szkole podstawowej. Określono cechy charakterystyczne dzieci z pokolenia cyfrowego. W oparciu o uzyskane wnioski uzasadniono konieczność wprowadzenia technologii informacyjnej na lekcjach matematyki. W końcu zidentyfikowano podejście oparte na kształceniu kandydatów na nauczycieli do tworzenia ćwiczeń interaktywnych, zwłaszcza poprzez dostępny online serwis Learning Apps.

**Słowa kluczowe:** technologia informacyjna, szkolenie przyszłych nauczycieli, serwis internetowy Learning Apps, ćwiczenia interaktywne

Svetlana Skvortsova, Tetiana Britskan

### **Подготовка будущих учителей начальной школы к использованию сервиса Learning Apps в процессе обучения математике**

#### **Аннотация**

Статья посвящена исследованию проблемы подготовки будущих учителей начальной школы к использованию информационных технологий (ИТ) в обучении учащихся математике, в частности, в аспекте использования различных онлайн ресурсов, онлайн сервисов для учителей и других педагогических программных средств. Проанализированы результаты диагностики состояния подготовки будущих учителей к внедрению ИТ на уроках математики в начальной школе. Выявлены особенности цифрового поколения детей, и, исходя из этого, обоснована необходимость внедрения ИТ на уроках математики. Определены подходы к обучению будущих учителей создавать интерактивные упражнения, в частности с помощью онлайн сервиса Learning Apps.

**Ключевые слова:** информационные технологии, подготовка будущих учителей, онлайн сервис Learning Apps, интерактивные упражнения

Svetlana Skvortsova, Tetiana Britskan

### **Formación para futuros profesores de escuela primaria en uso de servicio aplicaciones de aprendizaje en matemáticas**

#### **Resumen**

Este artículo investiga la formación de futuros docentes de primaria en el uso de la tecnología de la información (TI) en la enseñanza de las matemáticas, en particular, en el uso de diversos recursos en línea, servicios en línea para docentes y otro tipo de software pedagógico. Se analizan los resultados del diagnóstico de una condición de la formación de futuros profesores para la implementación de las TI en las clases de matemáticas en primaria. Se han determinado las peculiaridades de la generación de niños nativo-digiales y, en base a esto, se ha corroborado la necesidad del uso de TI en las asignaturas de matemáticas. Además, se han identificado los enfoques para capacitar a futuros docentes para crear ejercicios interactivos, en particular a través de Learning Apps.

**Palabras clave:** tecnología de la información, formación de futuros profesores, sitio web de Learning Apps, ejercicios interactivos



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## **E-tutor for E-learning**

### **Abstract**

The article elaborates on the concept of the e-tutor providing high academic achievement in electronic and blended learning. Moreover, the arrangement of the e-tutor, the instructional process features, and the scheme of the whole system functioning are given, while the concepts of a task kit, a normalised lesson, e-tutoring, and an e-tutor are introduced.

**Key words:** electronic and blended learning, electronic tutor, educational material presentation and assimilation, task kit

### **Introduction**

Having barely begun, the era of e-learning has faced the fact that a very low percentage of students complete their education at an acceptable level (Sun et al., 2008). This fact has brought to life numerous ways to increase the level of academic achievement. Formative assessment, SOLO taxonomy, educational analytics, and artificial intelligence require either very serious statistics or intervention by tutors. Every method has its advantages and disadvantages, but no one gives the ideal results, so educators continue developing methods to guarantee high academic achievement in electronic education.

One of the methods that can improve the situation with academic achievement can be the creation of a special type of textbook for use in e-learning. In such a textbook, attention is paid not only to the presentation of educational material,

but also to its assimilation, for which it is provided with all necessary elements. The peculiarity of the approach lies in the fact that the conditions are created for the achievement of high performance by all students in advance, which greatly simplifies both the management of the instructional process and the accumulation of the relevant statistics. Let us now consider the cognitive textbook concept.

## Necessary Definitions

**A task kit** – the number of different tasks for assuring the assimilation of a portion of the educational material relating to all aspects of the material to be mastered.

**A normalised lesson** – an electronic resource with educational material, subject to mastering at one time. It contains a presentation of the material, limited by the number of elements to be learned, and a task kit that ensures their assimilation. Elements can include concepts and connections between them.

**E-tutoring** – a set of procedures that ensure a cyclic (in the case of failing to complete a task kit) presentation of the curriculum material of a normalised lesson with the subsequent presentation of a task kit to be completed. Procedures provide:

- evaluation of the completion of tasks;
- fixing the assimilated lesson;
- the student's return to the study of that part of the lesson the tasks for which turned out not to be completed (for this case it is desirable to have a more detailed presentation of the educational material);
- presentation of a modified task kit; and
- teacher information tools.

**E-tutor** – a set of normalised lessons on the subject with procedures that provide e-tutoring. The Russian term *uchebnik* has no equivalent in English, and is usually translated as “textbook.” What is being discussed for e-learning can still be called an *uchebnik* in Russian, but for the English equivalent it is necessary to use a different term.

## A Normalised Lesson and a Task Kit

The reasons for limiting the number of knowledge elements presented to students in one electronic session, as well as the necessary number of tasks corresponding to these elements, are detailed in the author's article (Fedoseev, 2016).

The point is that a person can keep in mind only a few elements at a time. For the purposes of education, the maximum number of these elements is recommended not to exceed five. At the same time, if the number of studied elements is less than three, then it is not possible to attract the attention of students. They perceive such a lesson as empty and not deserving attention. Thus, the number of elements is in the range of three to five (Petrova, 2014). Apparently this is what Salmon Khan said in his lecture delivered to the students of the Massachusetts Institute of Technology in 2012 (<https://www.youtube.com/watch?v=VA273i3z7Mk&nohtml5=False>), tracing the fact that – if possible – video clips should be short. It is desirable for them to last three minutes. He did not count elements, but understood that the video lesson should be as short as possible. What are these elements? Each element of new knowledge must be indivisible, single. If in the presentation of the material elements of already assimilated knowledge are used, then they can be arbitrarily complex, for example Newton's binomial, Ohm's law, or even dynamics or electricity – according to how the acquired knowledge fits into memory.

As for the task kit, it is necessary to have as many types of tasks as necessary for a convincing demonstration of the assimilated knowledge. So, we need conceptual (Geller, Son, & Stigler, 2017) questions for each new element. Next, we need tasks on the correlation between the new elements, as well as between the new elements and the ones which have already been mastered. Should there be a need, there must be tasks on the correlations between the three elements, with each element being a parameter in turn. There could be other types of tasks according to the subject.

The author has not managed to find pedagogy publications about the normalisation of the number of elements of the material presentation and the formation of a task kit. So it would not always be possible to do both in the best way from the first attempt without any methodical advice. What can happen in this case will be described below. Now we can only note that such a normalisation both in the number of elements of knowledge and in the number and type of tasks is already better than an arbitrary presentation of the educational material, provided with a random set of control tasks.

## **Instructional Process with an E-tutor**

The most effective organisation of the instructional process with an e-tutor is the flipped classroom method (Bergmann & Sams, 2012). In the after-hours, students study the educational material of the normalised lesson, after which they perform the tasks from the kit. If necessary, the e-tutoring procedures control their performing until the tasks from the kit have been completed, which indicates the mastery of the lesson material. In the next lesson, those students who have coped



with the task come fully prepared for further study. Information about the ones who could not complete the tasks or did not fulfil them comes to the teacher before the beginning of the lesson so that appropriate measures can be taken. Since the new material will also be studied in after-hours time, the teacher has the opportunity to pay closer attention to the lagging students during the lesson, offering others individual or group work, for example a project. In any case, with the help of the teacher or without it, the student will have the opportunity to begin the next lesson only after completing the set of tasks. It should be noted that during the lesson, no marks are given to the students. The fact that one of them has not coped with the task can generally remain unnoticed by the class. This situation positively affects students because there is no comparison among them (Wiliam, 2011).

During the execution of the tasks, it may turn out that the unexecuted tasks do not point to the new material of this lesson, but to the one that has supposedly already been learned. Then the student will automatically be offered the portion of the material which caused him or her difficulties, accompanied by a corresponding task kit. After their completion, the e-tutor will return the student to the current assignments. It may happen that the material of another subject causes difficulty. For example, in studying Ohm's law, one of the elements of the material already studied is the element named "algebraic transformations" related to mathematics. In this case, if there is a corresponding e-tutor in mathematics, the student will also be redirected to the topic of algebraic transformations. If there is no such e-tutor in mathematics, the student will be given a recommendation to individually find and study the relevant material.

The feature of an e-tutor use is that the assessment of academic achievements is not carried out at the level of the whole subject, but rather at the lesson level. At the same time, an acceptable level of achievement is accomplished, determined by the completion of task kits. Once placed at the disposal of the student, an e-tutor remains with him or her, which makes it possible to refresh knowledge on a particular topic at any time. In addition, as has already been shown, there is a method of sending the student to those topics which he or she has forgotten, which makes it possible to refresh the weakened knowledge. The system as a whole allows one to abandon any other types of evaluation. Examinations become unnecessary because the successful completion of the task kits for each lesson for every student is fixed.

## **Self-diagnostics and Improvement of the E-tutor**

The best proof of mastering an educational material is the ability to use it in practice. Since most of the topics of the subject are related to each other, the usual

situation is that the knowledge obtained earlier on other topics – and often in other subjects – is used to perform the tasks of the current topic. Since all the results of students in all lessons are fixed, statistical analysis becomes available. For example, all students in accordance with the action of the e-tutoring have received acceptable assessments on one topic. Knowledge obtained on this topic should be applied in some other topics where it is found that the use of this knowledge causes difficulties for the majority of students. Thus, the e-tutoring sends students to repeat that topic. They successfully complete the task kit on it. After that they again have difficulty in performing tasks for current topics. Obviously, the developers of the e-tutor should carefully consider the topic. Most likely, there is something wrong with the task kit.

Let us consider another example. At the level of a universal stable performance, one of the topics causes such difficulties that most students have to turn to the teacher's help. The situation indicates that the material in this topic is too difficult to master in one session. Apparently, there is a violation of the limitation on the number of elements of knowledge in the discussion.

These elementary examples show what opportunities exist for improving the electronic tutor used. This means that, perhaps, if the first experience is not successful, it can be improved quickly.

## **How It Should Work**

First of all, there must be a coordinator of electronic tutor developers, whose task is to:

- provide relevant developers with appropriate instruction and software to develop normalised lessons;
- ensure following the rules of normalised lessons, including task kits;
- form and maintain versions of electronic tutors; and
- conduct statistical studies on the quality of electronic tutors, as well as collect comments from teachers, transfer the accumulated material to the developers, and monitor the correction.

It is not necessary for the authors of the electronic tutors to be the authors of the corresponding textbooks. Electronic tutors can be collected from separate normalised lessons created by teachers together with their students by the method of so called “people's construction.”

Let us assume that an electronic tutor has been created. Now we need to bring it to schools and start the process. The easiest way to do so is to place the e-tutor in the cloud and provide access to it for students of schools that have a contract with the provider. However, with regard to Russia, there are still a lot of schools that do not have enough communication bandwidth to ensure the daily work of

all students in the system of e-tutors. Therefore, along with the cloud location of e-tutors, S+S (Software + Services) technology (Wilson, 2008) will have to be used, whereby the bulk of data in the form of multimedia content of e-tutors will be on students' computers, and a relatively small amount of information related to learning management will travel through communication channels. This information includes data such as the identification of the student, including a class and a school, the page number of the e-tutor visited during the last session, the results of the assignments, and other official data.

It is assumed that the student can work with the electronic tutor on any computer which has access to the Internet if in advance he or she made sure that the tutor's content was posted on this computer. If one makes sure that the content is protected from unauthorised use, then it can be distributed completely free of charge. It becomes effective only under the control of the cloud system, after identifying the student.

What is most currently acceptable for the operation of the system of electronic tutors is a distributed network using Blockchain technology (Bogdanova, 2017). This technology is protected from unauthorised access. It allows one to accumulate and use data about subjects and lessons learned by students. Data are saved when the student moves from one school to another. Each school or group of schools can have nodes of the Blockchain network. Naturally, a certain coordinator is needed, connecting and disconnecting schools, providing access to students and teachers, as well as issuing certificates or other documents upon completion of tutoring.

The general scheme of the functioning of the system is as follows. A school signs a contract with the provider of e-tutors. On the basis of the contract, the school is supplied with software to ensure students' access. Herewith the name of students and other personal data circulate only within the school. Outside, the student is represented only by a unique code. The school is also provided with copies of the content of electronic tutors in the case of communication bandwidth absence for students' work. Each student copies the content to any computer that he or she is going to use for learning in the system. After the codes are assigned and transferred to the provider, and the content is copied to the desired computers, one can start work. Students receive a task to study a certain lesson at home with the help of the e-tutor. Each student performs the task at a convenient time, using the computer which he or she has access to. Some of them will reach an acceptable result on their own. Someone will need help from parents or other relatives. And someone does not cope with the task. The results of all the achievements of the students come to the teacher in such a way that the teacher can study them before the next lesson with the class. The work of the teacher with students who cannot cope with the task is to explain their mistakes and encourage them to complete the task kit of the e-tutor. Those students who did not fulfil the task will have to fulfil it; otherwise, they will not be able to proceed with the materials of the following lessons. As students complete the task kit, data about this fall into the nodes of

the Blockchain network. The accumulated data are used to admit students to the materials of the following lessons, to issue appropriate certificates, to get acquainted with the students' achievements at their admission to the university, and to improve electronic tutors on the basis of statistical analysis. If the student moves to another school, the relevant code of the system is transferred to the new school by the administration, after which the administration of the new school can get acquainted with the student's achievements and propose a further educational trajectory for him or her.

## Conclusion

The e-tutor system outlined above supports a full didactic cycle, and not only the presentation of educational material. It offers a special organisation of the educational process, which removes the limitation of time during a lesson. It takes into account the recommendations for the volume of the lesson's teaching material and offers a task kit necessary for mastering it. At least theoretically, all the problems that prevent high achievement in all students are solved. To test theoretical positions in practice, several Moscow schools have now taken part in an experiment to create and use several standardised lessons in physics and history. Achieving a positive result will make it possible to recommend the system for widespread use.

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## E-tutor w e-learningu

### Streszczenie

W niniejszym artykule przedstawiono pojęcie e-tutora, który pomaga osiągnąć wysokie wyniki podczas zdalnego uczenia się oraz kształcenia łączącego zdalne i tradycyjne modele uczenia się. Zaprezentowano strukturę pracy e-tutora, cechy procesów szkolenia, a także schemat funkcjonowania całego systemu oraz wprowadzono pojęcia zestawu zadań, lekcji znormalizowanej, e-tutoringu oraz e-tutora.

**Słowa kluczowe:** nauczanie drogą elektroniczną i mieszane, tutor elektroniczny, prezentacja i asymilacja materiału kształcenia, zestaw zadań

Andrei Fedoseev

## Электронный тьютор для электронного обучения

### Аннотация

Предлагается концепция электронного обучения, обеспечивающая высокие академические успехи в электронном и смешанном обучении. Предложено построение электронного учебника, особенности учебного процесса и схема функционирования всей системы. Представлены концепции набора задач, нормализованного урока, электронного обучения и электронного тьютора.

**Ключевые слова:** электронное и смешанное обучение, электронный тьютор, презентация и ассимиляция учебных материалов, комплект задач

Andrei Fedoseev

### **Tutor en línea en la educación en línea**

#### Resumen

El artículo explica el concepto de tutor en línea, quien ayuda a lograr altos resultados en la enseñanza a distancia o en el aprendizaje que combina modelos de enseñanza a distancia y tradicionales. Presenta la estructura del tutor en línea, características de los procesos de enseñanza, y también el esquema de funcionamiento de todo el sistema; se introducen los conceptos de conjunto de actividades, de clase normalizada, de tutoría en línea y de tutor en línea.

**Palabras clave:** enseñanza en línea y aprendizaje combinado, tutor en línea, presentación y asimilación del material educativo, conjunto de actividades



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## **Requirements for Creating a Game Learning System Using Mobile Applications for Primary School Students**

### **Abstract**

An interest in integration of mobile applications in education will continue to rise. What is necessary nowadays are such didactic methods that will facilitate and accelerate the transmission of knowledge to students, activate a process of mastering knowledge, teach them to undertake independent work with the given material, and enhance the productivity of educational process and teachers' work. Such methods of studies can be realised on the basis of the use of information technologies in education. The basic problem is a requirement to develop methods and resources for support of the use of mobile technologies by elementary school students. Mobile technologies can make the learning process more interesting, answer the requirements of today, and give necessary information at the right time. In this model, the activity approach will be employed. The cognitive activity of a child will get organised in such a form that opens him or her for knowledge, so that learning becomes the main activity, as required by the discussed programmes. The article analyses the game models necessary for the education and development of children of elementary school age. The contents of mobile platform gaming models are revealed. The article also provides the classification of the proposed products that promote the learning and development of a child, the so-called soft skills and hard skills. The suggestions for using gaming models on different devices are given. The requirements for the use of gaming models of mobile platforms in the educational process are offered.

**Key words:** gaming models of mobile platforms, mobile devices, soft skills, hard skills, elementary school children, innovative learning, classification of educational games, BYOD

## Introduction

### Formulation of the Problem

At present, the school needs such an organisation of its activities, including monotonous memorisation activities, that would ensure the development of individual abilities and a creative attitude to the life of each student, which entails the introduction of various innovative programmes, the implementation of the principle of a humane approach to children, and so on. In modern school, there is an urgent need to expand the methodological potential in general, and active forms of learning in particular. Such active forms of learning include gaming technology.

Gaming technology is one of the unique forms of learning, which allows one to make interesting and exciting not only the work of students at the creative and search levels, but also the everyday steps in learning subjects. The fun of the conventional world of the game makes it positive and emotionally coloured, and the emotionality of the game action activates all the psychological processes and functions of the child. Another beneficial aspect of the game is that it promotes the use of knowledge in the new situation; thus, the material acquired by the students goes through a kind of practice, and brings diversity and interest to the learning process (Traxler, 2009).

The relevance of the game is currently increasing due to the oversaturation of the modern world with information. All over the world – and in Ukraine in particular – the subject–information environment is immeasurably expanding. Television, video, radio, and computer networks have recently flooded students with a huge amount of information. The actual task of the school is the development of assessment and selection of the information received. One of the forms of training that develops such skills is a didactic game that promotes the practical use of knowledge gained in the classroom and during extracurricular time.

The game is a natural and humane form of education for the child. Teaching through the game, we teach children not in the way that is convenient for us to give educational material, but in the way that ensures convenient and natural acquisition for children.

### Analysis of Recent Research and Publications

In 2013 in the USA, the research laboratory of The Joan Ganz Cooney Center, within the framework of the Games for a Digital Age project, conducted an experiment on the adaptation of games to the educational process. As a result, let me present the following classification of the appropriateness of the game:

- 1) “we train and work out,”
- 2) puzzle games,
- 3) online learning tools,
- 4) role-playing games,



- 5) strategies,
- 6) action / adventure, and
- 7) simulation (Takeuchi & Vaala, 2013).

The worldwide organisation of UNESCO worked out recommendations on mobile education in a document authored by Mark West and Steven Vosloo (along with members of the consultative committee – Claudia Liliana Aparicio Yañez, Sarah Crampsie, Lauren Dawes, Sanna Eskelinen et al.). Researchers offer the conception of BYOD, that is, “Bring Your Own Device,” by means of which a student will be able will study through the smartphone. UNESCO believes that mobile technologies can significantly increase and improve educational opportunities in a wide range of settings (“UNESCO Policy guidelines version 2.1...”). Below I mark the improvements on this conception of UNESCO.

- 1) **Mobility.** On the one hand, it entails the possibility to realise the educational programmes wherein high quality specialists cannot participate physically. On the other hand, modern technologies – namely, the systems of cloud storage of data – allow one to carry out learning without attachment to the certain devices; a student can change a cellular telephone, but all his or her educational materials will be accessible via the cloud.
- 2) **Continuity of education.** Mobile devices that always are with a person and belong to them personally make the process of education continuous: because students can execute tasks at any time, teachers can take the passive part of educating outside the classroom, and use school hours for the development of social skills. Students can choose how and when to do their assignments outside of school.
- 3) **Personalisation of educating.** Mobile devices allow the students to choose the level of complexity of tasks and content independently, moving up in learning at their own pace. In addition, a mobile phone gives an opportunity for every student to process material in most comfortable way for them. It means that the developers of the educational programmes for mobile phones must use various methods of conveying the same information – text, charts, images, video – for greater efficiency.
- 4) **Upgrading communication.** Mobile devices make it possible to line up rapid and quality communication between teachers, students, and educational establishments. Student feedback allows teachers to monitor individual student performance statistics on a case-by-case basis. In addition, by means of mobile phone a teacher maintains continuity of educating.

In the extended materials of the UNESCO recommendations, the authors present the main benefits of mobile learning that are confirmed by international practice:

- 1) empowerment and provision of equal access to education,
- 2) personalisation of learning,

- 3) instant feedback and evaluation learning outcomes,
- 4) training at any time and in any place,
- 5) efficient use of time in classroom lessons,
- 6) formation of new student communities,
- 7) support of situational training,
- 8) development of continuous “seamless” learning,
- 9) ensuring communication between the formal and informal learning,
- 10) minimisation of the consequences of break in the educational process in military conflict zones or areas stricken by natural disasters,
- 11) assistance to students with limited opportunities,
- 12) improvement of the quality of communication and management, and
- 13) maximising cost effectiveness (“UNESCO Policy guidelines...”).

In Ukraine, the problem of mobile learning was addressed by a number of scientists, among them: Valery Bykov, Victoria Vember, Andriy Gurzhiy, Miroslav Zhaldak, Vasil Kremen, Natalia Morse, Oleg Spirin, and many others.

The research of Natalia Boyko, Valentina Panchenko, Vladyslav Gavlovsky, and other scientists reveals the importance, role, and influence of information flows from global networks for the modern educational process.

Most researchers in the field of mobile learning emphasise that the use of mobile means in the learning process helps overcome the communication barrier, build research skills, as well as increase the motivation to acquire skills, thinking, and competencies and use them in life.

**The purpose of the article** is to formulate the requirements for the use of gaming models of mobile platforms during the educational activities of a junior student in view of the improvement of thinking and learning.

## **Theoretical Bases of the Research**

The world of the latest information technology contributes to the systematic movement of the learning process to the mobile space, in which children are more versed than many adults. Every day, millions of students launch mobile apps on their smartphone, contributing to the rapid development of this isolated culture. This is the lifestyle of children, their comfort zone; ignoring or forbidding attitudes of teachers and parents will cause an increase in conflicts and even more alienation from the school. We see the opportunity to prevent such a trend in the transformation of gadgets from the means of communication and entertainment into the means of training (Marshall, 2011).

Nigel Paine, a member of the International Advisory Board at the University of Pennsylvania in Philadelphia, highlighted the elements of mobile learning, of which the main ones are as follows:

- 1) mobile learning provides the opportunity to use free time intervals;
- 2) mobile applications should be compact and activated from the place where the work was interrupted;
- 3) mobile applications must be available on the Internet, and be synchronised with mobile learning tools.

In his research about mobile education, Paine presented the following comments:

- 1) people are ready to use mobile telephones in such situations in which they will not choose to use a book or notebook;
- 2) mobile educating is at its peak right now: it is attractive because of not only its novelty, but also comfort and practicality, so the majority of employees would be thankful for it;
- 3) in mobile devices, one competes for attention of users mainly in games, so that countless pages of text formatted for a mobile screen will not contribute to keeping the user's attention;
- 4) "idle time" is precious and can be used;
- 5) the level of possible concentration excels the ordinary level of concentration at an office;
- 6) if it is not an infringement of the copyright policy in one's educational institution, one is advised to create mobile applications for iPhone, Blackberry, Google Android, or Windows Phone;
- 7) applications must be small-sized, but they must be capable of continuing from the same spot where one left off;
- 8) if one's applications are supposed to be accessible online through a laptop or a computer, it is necessary to synchronise them with a mobile phone; having used the application on one type of device and switching to another, one ought to be able to continue at the same spot where one left off;
- 9) it is not crucial to study all the Software Development Kit – there are numerous specialists who process the given material to make an application for iPhone or Google Android;
- 10) one's applications must be exciting and involving – they should be able to compete with games in this respect (Paine, "10 элементов мобильного обучения...").

Basing on Paine's opinion, I wish to formulate a number of requirements for gaming models for using devices during learning.

From my own teaching experience in school, I have observed that students willingly use their mobile devices in search of solutions to problems. During computer science lessons, students used special mobile applications for the topics of classes; for example, using programming on the screen, children could build their

game after building the application, and read obvious errors in the development of the programme and correct them in real time. The students built their own algorithms themselves, played their games in the class, found errors and described them. Learning success rates were improved as children felt free to choose and could implement their own ideas based on the acquired knowledge.

This approach was based on the recommendations of the UNESCO Mobile Education Policy and the work of Nigel Paine, who presented proposals for the use of mobile devices as a learning tool, for the tablet devices shown in Figure 1, for the tablet in Figure 2, for the game console in Figure 3.

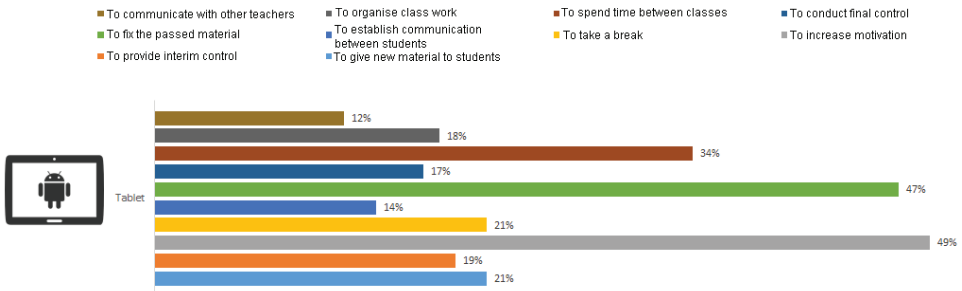


Figure 1. Purposes for tablets.

Source: Own work.

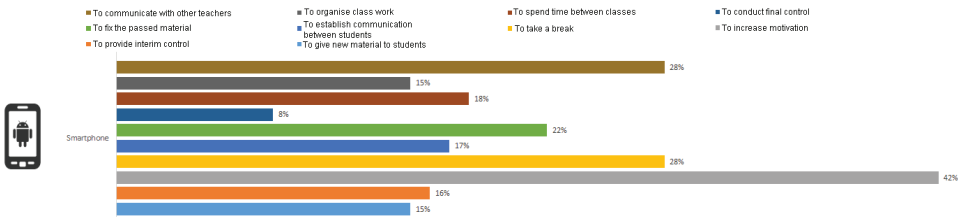


Figure 2. Purposes for smartphones.

Source: Own work.

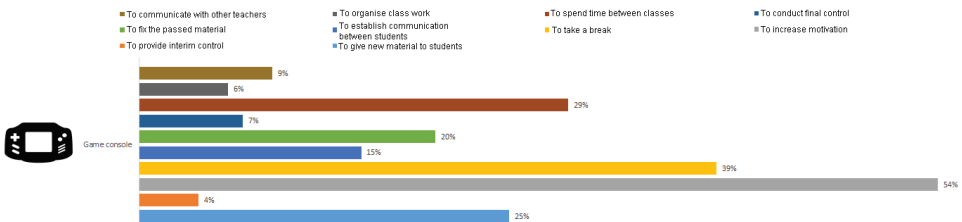


Figure 3. Purposes for gaming consoles.

Source: Own work.

Gaming technology is an integral part of educational technology. Pedagogical technologies differ in terms of the prevailing methodology when using game technologies:

- in the field of activity: physical, intellectual, labour, social, and psychological;
- in the nature of the psychological process: teaching, training, controlling, generalising; cognitive, educational, developing; reproductive, productive, creative; communicative, diagnostic, career guidance, psychotechnical;
- in game technique: subject, plot, role, business, imitation, and dramatisation;
- in the subject area: mathematical, physical, ecological; musical, theatrical, literary; labour, technical; physical training, sports, military and applied, tourist and folk sports; social, administrative, and economic sciences;
- in the game environment: without subjects / with subjects; desktop, room, street, terrain; computer, television; technical, with means of transportation.

The duration of various games is different:

- short games – these include subject, story, and role-playing, and other games used to develop interest in learning activities and to solve specific problems: mastering a specific rule, working out a skill, and so on;
- the gaming shells – these playful forms of organisation of educational activities are more time-consuming; most often, they are limited to one session, but can last a little longer; these include the technique of creating a single game shell, that is, presenting the lesson in the form of a holistic study – the game;
- long-lasting educational games – games of this type are designed for different time intervals and can last from a few days or weeks to several years; they are focused on a distant ideal goal and are aimed at the formation of the mental and personal qualities of the student. The special features of this group are its seriousness and business-like character.

In the lives of people, the game performs such important functions as:

- entertaining (the main function of the game is to entertain, give pleasure, inspire, arouse interest);
- communicative (mastering the dialectic of communication);
- self-fulfilment (the game as a “human practice training base”);
- therapeutic (overcoming various difficulties arising in other types of activity);
- diagnostic (detection of deviations from the regulatory behaviour, self-knowledge in the game);
- corrective (making positive changes in the structure of personal indicators);
- international communication (assimilation of sociocultural values that are common for all people); and
- socialisation (inclusion in the system of social relations, the assimilation of the norms of human society).

## Results of the Research

Educational mobile applications should have an interactive design of user interface, dialogic functions, and multimedia elements that are intended for independent work of kids (under the guidance of a teacher or without it); they should help solve the actual tasks in educational and cognitive activity of the user, motivating him or her for further education. The main obligation here is didactic content. This means that the didactic application is perceived as a mobile training programme, designed by developers taking into account the optimal set of key principles of didactics and methodology teaching.

In the pedagogical process, the game acts as a method of training and education, transferring the accumulated experience, starting from the very first steps of human society along the path of its development. In a modern school that relies on the intensification of the educational process, the activity of playing is used in the following cases:

- 1) as independent technologies for the development of the concept, topic, and even section of the academic subject;
- 2) as elements of a more extensive technology;
- 3) as a lesson (occupation) and its part (introduction, explanation, fixing, exercise, control); and
- 4) as a technology extracurricular work (Traxler, 2009).

The concept of “gaming pedagogical technologies” includes a rather extensive group of methods and techniques for organising the pedagogical process in the form of various pedagogical games. These differ in general from games in that they have the goal of learning and the corresponding pedagogical result, which are in turn justified, highlighted in form, and characterised by educational and cognitive orientation. The peculiarity of the pedagogical game is that the situation of the class–lesson learning system does not allow the game to manifest itself in the so-called “pure form” – the teacher must organise and coordinate the children’s play activity. The game form of classes is created in the classroom with the help of game techniques and situations that should act as means of motivating and encouraging students to learn activities (Rekkedal & Dye, 2009). The implementation of gaming techniques and situations in the regular form of classes is held in the following main areas:

- 1) the didactic goal is set for students in the form of a game task;
- 2) educational activities are subject to the rules of the game;
- 3) educational material is used as its means;
- 4) competitions are introduced into the educational activity, contributing to the transition of didactic tasks to the category of games; and
- 5) successful execution of the didactic assignment is associated with the game result.

During the school year, in the centre of development of own recommendations on the use of mobile system, an article by Nataliia Morze was written, which described the basic knowledge and skills for each level, from beginner to expert. Accordingly, at each level of studying, the following recommendations for the whole game system are formed. Based on all levels and requirements, examples are given that include one common system (Morze, 2010).

Requirements for gaming systems in education are as follows:

- 1) the playing shell must be given a game plot that motivates all students to achieve game goals;
- 2) the team as a whole and each player personally ought to be included;
- 3) each student should have the possibility of action;
- 4) the result of the game should differ depending on the efforts of the players – there must be a risk of failure;
- 5) game tasks must be selected so that their implementation is associated with certain difficulties; on the other hand, tasks should be accessible to everyone, so it is necessary to take into account the level of participants in the game and tasks to pick from easy ones (practising the training skills) to those which require considerable effort (the formation of new knowledge and skills);
- 6) the game should not be the only possible way to achieve the goal; and
- 7) different means must be provided to achieve game goals.

The following needs should be realised:

- the presence of own activities,
- creation,
- communication,
- self-determination through role-based experimentation, and
- self-determination through the trials of activities.

The structure of the game as an activity of a person includes the following stages:

- 1) goal setting;
- 2) planning;
- 3) achieving the goal;
- 4) analysis of the results; and
- 5) opportunities of choice and elements of competition, satisfaction of needs, self-affirmation, self-realisation.

The structure of the game as a process must include:

- the roles assumed by the players;
- game actions as the means of implementing these roles;
- game use of objects, i.e. replacement of real things with game-based, conditional objects;
- real relations between the players; and
- the plot (content) – the area of reality, conditionally reproduced in the game.

Mobile education apps must meet a number of requirements, namely:

- compactness – the components of mobile learning should be short due to the fact that they are available in an environment in which potential interruptions in communication are likely to occur;
- high level of microergonomics – high quality image / sound at small screen size, and small size of the output file (download speed);
- comprehensiveness and accessibility – the mobile educational application should be obtained regardless of one's location; an increasing range of mobile network operators and the availability of mobile devices provide a widespread presence of mobile learning services convenient for the student at any time;
- on demand access – by its nature the mobile device provides access on demand for the student, maximising the potential of delivering valuable content at the moment of need.

Using mobile devices, kids and educators from different countries receive access to large educational resources, can discuss information and share it with other students, receive support from colleagues and teachers, and learn to communicate effectively. Of course, mobile technologies are not and will never become a panacea for education; however, this powerful and often underestimated means may take education to a whole new level (see Sarrab, 2014; Sarrab, Al-Shihi, Al-Khanjari, & Bourdoucen, 2018).

Let us take a look at some of the benefits of mobile learning, highlighted by employees of UNESCO.

1. Enhancing opportunities and ensuring equal access to education. Prices of mobile phones are constantly falling, so an increasing number of people, even in the poorest regions, have the opportunity to purchase these devices and know how to use them. At present, there are many projects in different countries working on the application of mobile technologies and on providing modern training materials for everyone.
2. Personalised training. Mobile devices are usually at their owners' disposal all day and have plenty of features that can be customised. That is why mobile technologies provide wider possibilities for personalisation than non-mobile ones.
3. Instant feedback and evaluation of learning outcomes. Mobile technology makes the process of assessing the learning results considerably faster, and gives students and teachers the ability to quickly track the students' progress.
4. Training anytime and anywhere. Because most of the time mobile devices are with their owner, he or she can study anytime and anywhere. Mobile training applications are given to the user.
5. Possibility of choice. One can perform an exercise that takes a few minutes, or completely concentrate on the task within a few hours, which contributes to flexibility of the learning time (“UNESCO Policy guidelines version 2.1...”).



## Conclusion

Analysing works of scientists in area of the use of mobile devices in education, we can reach the conclusion that these technologies will improve the process of education, because what they entail are both fast access to the authentic educational, certified resources and programmes at any time and in any place, and permanent feedback with a teacher and an educational institution. This requires the following:

- 1) an account of individual features of a student useful in diagnostics of problems or an individual pace of learning;
- 2) increasing the motivation of technical equipment and virtual learning;
- 3) organisation of autonomous educating;
- 4) creation of personalised, professionally oriented educational facilities for children;
- 5) quick access to authentic educational resources and programmes anytime and anywhere;
- 6) constant feedback from the teacher and the learning community;
- 7) development of skills and capacities for the continuous educating throughout life.

The traditional approach of teachers of elementary school to the formation of competences of students contributes to the problem of students' loss of interest and motivation in the study of general curriculum. As a result, there is a necessity for modernising the traditional system of teaching by means of online tutorials. Mobile online tutorials are highly sought today among the primary school students; these tutorials are able to become the effective means of increase in motivation if on the prototype stage of development of the mobile programme the optimal methods (proper functions, motivational necessities, and features) are used. In this article, I described the process of creation of mobile applications for studying. It also turned out that the problem of developing only the classification of the principles of methodology of primary school students' subjects study remains relevant. This aspect made it much more difficult to identify functional ways of implementation in mobile resources. In the context of educational mobile applications, it makes sense to work out the programme whose functions correspond both to a child's needs and motivation, and to methodical or didactic principles and terms.

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Vladyslav Bilous

## **Wymogi tworzenia systemu gier edukacyjnych dla uczniów szkoły podstawowej z wykorzystaniem aplikacji mobilnych**

### Streszczenie

Zainteresowanie zintegrowaniem aplikacji mobilnych z edukacją będzie stale wzrastało. W dzisiejszych czasach potrzebne są takie metody nauczania, które ułatwią i przyspieszą przekazywanie wiedzy uczniom, zaktywują proces opanowania wiedzy, nauczą samodzielnej pracy z materiałem, a także zwiększą efektywność nauczania i pracy nauczycieli. Takie metody nauczania mogą być realizowane dzięki wykorzystaniu w edukacji technologii informacyjnych. Podstawowym problemem jest wymóg opracowania metod i zasobów wsparcia użycia technologii aplikacji mobilnych w nauczaniu i uczeniu się z szkole podstawowej. Technologie mobilne mogą uczynić proces nauczania i uczenia się bardziej interesującym, spełniającym wymogi współczesnych czasów oraz dostarczającym koniecznych informacji we właściwym czasie. W opisywanym modelu wykorzystane jest podejście oparte na aktywności uczniów. Poznawcza aktywność dziecka ma zostać zorganizowana w takiej formie, by uczeń mógł się otworzyć na wiedzę, a uczenie się stało się główną aktywnością, zgodnie z wymogami programów. W artykule przeanalizowano modele gier potrzebnych w rozwoju i edukacji dzieci w szkole podstawowej. Przedstawiono treść platform do gier dla aplikacji mobilnych. W dokonanej przeglądnę zaproponowano klasyfikację proponowanych produktów, które promują uczenie się i rozwój dziecka, jego umiejętności określane jako kompetencje twarde i miękkie. Podano propozycje wykorzystania modeli gier dla różnego rodzaju urządzeń. W końcu przedstawiono wymogi dla wykorzystania modeli gier dla platform mobilnych w procesach edukacyjnych.

**Słowa kluczowe:** modele gier dla platform mobilnych, urządzenia mobilne, kompetencje miękkie, kompetencje twarde, uczniowie szkoły podstawowej, innowacyjne uczenie się, klasyfikacja gier edukacyjnych, BYOD

Vladyslav Bilous

## **Требования к созданию игровой системы обучения с использованием мобильных приложений для учащихся начальных классов**

### Аннотация

Интерес к интеграции мобильных дополнений в обучение сохраняется на высоком уровне. Сегодня необходимы методы обучения, которые облегчают и ускоряют передачу знаний студентам, активизируют процесс усвоения знаний, учат приемам самостоятельной работы с материалом, способствуют образовательной активности и повышают эффективность труда учителя. Такие методы обучения могут быть реализованы на основе использования информационных технологий в образовании. Основной проблемой исследования является потребность в разработке методов и ресурсов для поддержки обучения в младшей школе с использованием мобильных технологий. Мобильные технологии могут сделать процесс обучения более интересным, предоставить необходимую информацию в нужное время, что отвечает требованиям сегодняшнего дня. Реализуется активный подход, познавательная деятельность ребенка организуется в той форме, при которой он открывает для себя знания, учеба становится пред-

метод активной деятельности, так как программы требуют активного управления. В статье анализируются игровые модели, необходимые для воспитания и развития детей младшего школьного возраста. Раскрыто содержание игровых моделей мобильных платформ. В обзоре предлагается классификация предлагаемых жанров, способствующих обучению и развитию ребенка, так называемых «Soft Skills» и «Hard Skills». Даны предложения по использованию игровых моделей на разных устройствах. Предложены требования к использованию игровых моделей мобильных платформ в учебном процессе.

**Ключевые слова:** игровые модели мобильных платформ, мобильные устройства, Soft Skills, Hard Skills, дети младшего школьного возраста, инновационное обучение, классификация обучающих игр, BYOD

Vladyslav Bilous

### **Requisitos para crear un sistema de gamificación usando aplicaciones móviles para estudiantes de Educación Primaria**

#### **R e s u m e n**

Existe un gran interés por la integración de las aplicaciones móviles en la educación. Estas metodologías mejoran la adquisición de conocimiento por parte del alumnado y la productividad docente. Estos métodos están basados en el uso de las tecnologías de la información en la educación. Se pretende apoyar a los estudiantes de Educación Primaria desarrollando metodologías y recursos basadas en el mobile learning que genera una mayor motivación y permite dar la información necesaria en el momento adecuado. Estas metodologías permiten un aprendizaje más personalizado y activo por parte del alumnado. El artículo analiza los modelos educativos basados en la gamificación necesarios para el desarrollo educativo de estudiantes de Educación Primaria. Se muestran contenidos de gamificación en plataformas móviles. La revisión sugiere la clasificación de los géneros propuestos para promover el desarrollo y el aprendizaje de los estudiantes en las llamadas Soft Skills and Hard Skills. Se ofrecen sugerencias para usar modelos de juegos en diferentes dispositivos. Se informa de los requisitos para el uso de estas metodologías y recursos en el proceso educativo.

**Palabras clave:** modelos de juegos de plataformas móviles, dispositivos móviles, soft skills, hard skills, estudiantes de educación primaria, aprendizaje innovador, clasificación de juegos educativos, BYOD



Reports





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## **Report on the Implementation of Work Package 7 “Dissemination of the Project Results” 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 ([www.irnet.us.edu.pl](http://www.irnet.us.edu.pl)). In particular, the article describes research tools, methods, and a procedure of the Work Package 7 “Dissemination of the Project Results,” that is, objectives, tasks, deliverables, publications, and implementation of research trips in the context of the next stages and Work Packages of IRNet project – International Research Network.

**Key words:** International Research Network IRNet, research results, dissemination, ICT, e-learning, intercultural competences

## Introduction

According to the Objectives, drawing on detailed empirical work being carried out by the project participants, Work Package 7 focused on:

- exploring the implications of this project;
- exploring how university staff and students attempt to implement project results; and
- assessing (as the final WP) the overall scientific results of the project and the practical plans for long term collaboration in the future.

The implementation of WP7 was carried out through several tasks, e.g.:

- detailing the nature of national and international concepts outlined above on the important purposes of the higher education sector and the relationship between the institution/sector and wider policy in Poland, the Netherlands, Spain, Slovakia, the Czech Republic, Portugal, Australia, Ukraine, and Russia;
- mapping the similarities and differences in the changing educational and social missions of universities in the area of developing of ICT, e-learning, intercultural competences in Poland, the Netherlands, Spain, the Czech Republic, Slovakia, Portugal with those of Australia, Ukraine, and Russia; and
- sharing knowledge on the social, legal, cultural, technological, and economic conditions giving rise to this.

The conclusions of the comparative research, and teaching approaches that help or hinder full-time, part-time, and postgraduate students' success in their studies, including different categories of knowledge development, are used in order to achieve successful learning outcomes.

ICT, e-learning, and intercultural competences play a central role in the education of citizens and training specialists in the knowledge society, and in the education of an international community through aid-based programmes.

Six documents were elaborated: 1) a comparison of National and European Law on Informatisation (NaELoI); on Education (NaELoE); on Higher Education (NaELoHE); on Informatization, on Development of Digital Society, Strategy of Economic Development (NaELoIoDoDSSSED); and on Development on Societal Policy and Lifelong Learning (NaELoDoSPLLL); 2) a comparison of competitiveness as a key factor for sustainable development of a country; Webometrics indicator ranking; Ranking of University's Repository (<http://repositories.webometrics.info/>); 3) relevance of the exchange between the partner countries for ERA within the framework of the IRNet project (2014–2017); 4) MA programme (in particular, E-learning in Cultural Diversity) and/or postgraduate studies, training courses etc., started in 2014–2017, including the WP2, WP3, WP5 survey results, other surveys and interviews; 5) internationalisation of every partner's university; 6) table: CWUR 2016 – World University Rankings and the comparison of IRNet universities (of the data in 2013 and in 2016 or 2017 in every partner's university).



Work continued on developing and improving the MOOC course “ICT tools in e-learning.” Focus groups (approximately 10 students) from every partner’s country participated in this course and produced the results which were comprehensively and deeply analysed.

Within the framework of WP7 implementation, more than 60 articles and 5 books were published, 5 conferences were held, and more than 20 seminars and workshops were organised.

The Project’s key achievements in terms of facts and figures are:

- 121.67 months of research staff exchange were carried out over the 2 years of the project,
- 29 researchers were involved in the exchange programme,
- more than 120 papers were published by members of the network, and
- 12 conferences and more than 50 seminars and workshops were organised.

A new scientific journal, *International Journal on Research in E-learning* (<http://weinoe.us.edu.pl/nauka/serie-wydawnicze/international-journal-research-e-learning>), was successfully developed. 3 volumes and 6 issues have been published so far; the publication of the next issues is in progress.

The mobility of researchers has created new links and contacts between different countries, considerably strengthened their collaboration, and significantly enhanced the dissemination of knowledge within the participating institutions and worldwide. In the further part of the project, the following partnership contribution to the collaboration is expected: a dataset for analysing the development of ICT, e-learning, and intercultural competences in EU countries; a literature and ICT tools review and analysis of their place in European educational systems and in project partner countries; the detailed methodology of developing ICT and intercultural competences for evaluation of the network research effects in educational institutions of EU countries; deepening the classification of different welfare state regimes, assessing their effectiveness to represent different educational institutions; a detailed identity of a teacher in each project country as an expression of a certain welfare and educational regime; nationwide studies to assess the network research effects in each country; cross-national studies on these effects; educational suggestions concerning the issues studied in the project. Project website: [www.irnet.us.edu.pl](http://www.irnet.us.edu.pl).

**The successful completion of the second stage (2016–2017) of the IRNet project and of the project in general provided several major outputs:**

- highest quality competence in research in advanced pedagogical science in the area of e-learning, ICT, and intercultural competences with a significant influence on the development of the HEIs staff, and of open information and educational environments from different regions / countries;
- reinforcement of ERA as an internationally-renowned partner of AU and an initiator of cooperation projects in the next Erasmus+, Cost, IVF, H2020 with an international cooperation dimension focused on the participation of

companies and development of the close cooperation with outstanding EU and AU partners; and

- synergy of the research offer with the requirements of an innovative education approach and strengthening the cooperation between EU and non-EU HEIs in the framework of an open educational environment and development of SMART universities.

## **WP7: Dissemination of the Project Results (Months 41–48)**

### **Objectives**

The main objective is dissemination of the WP1–WP6 results and research results on ICT, e-learning, and intercultural competences for developing contemporary specialists. They have a central role in education of citizens and training specialists in the knowledge-based society, and in education of an international community through aid-based programmes.

### **Description of Work**

ICT, e-learning, and intercultural competences have a central role in education of citizens and training specialists in the knowledge-based society, and in education of an international community through aid-based programmes. The tasks of this package are:

**Task 7.1.** Detailing the nature of national and international concepts outlined above for important purposes of the higher education sector and the relationship between the institution / sector and wider policy in Poland, the Netherlands, Spain, Slovakia, the Czech Republic, Portugal, Australia, Ukraine, and Russia.

Documents to compare (June 2017):

- National and European Law on Informatisation (NaELoI);
- National and European Law on Education (NaELoE);
- National and European Law on Higher Education (NaELoHE);
- National and European Law on Informatisation, on Development of Digital Society, Strategy of Economic Development (NaELoIoDoDSSSED);
- National and European Law on Development on Societal Policy and Lifelong Learning (NaELoDoSPLLL).

**Task 7.2.** Mapping the similarities and differences in the changing educational and social missions of universities in the area of ICT, e-learning, intercultural competences (and internationalisation of higher education) in Poland, the Netherlands, Spain, Czech Republic, Slovakia, and Portugal in comparison with those of Australia, Ukraine, Russia and comparing the research results from 2014 and 2017.

The following research results were employed:

- a survey;
- an analysis of the documents (national, international);
- finalisation of the Thesaurus (Vocabulary) on specific terms: ICT, e-learning, DL, intercultural competences; and
- preparing the start of the MA study and / or postgraduate study, training courses, etc.

**Task 7.3.** Conclusions on the comparative research and teaching approaches that enhance or hinder full-time, part-time, and postgraduate students' success in their studies, including the way in which different categories of knowledge (methods, forms, technologies, tools) are used to achieve successful learning outcomes.

Implementation of the task was achieved in the following steps:

- a survey of the full-time, part-time, and postgraduate students of different partner institutions concerning their satisfaction of the study (HSPU): [https://docs.google.com/forms/d/e/1FAIpQLSf6mBb4vXOk4uRrxk4aG0KmC6MVe kb3Qk6x64VvJK1nCB7lOA/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLSf6mBb4vXOk4uRrxk4aG0KmC6MVe kb3Qk6x64VvJK1nCB7lOA/viewform?usp=sf_link);
- the start of the MA studies (E-learning in Cultural Diversity, as described below) and / or postgraduate studies, training courses etc., with the possible consideration of the survey results. The mentioned MA programme and / or postgraduate studies, training courses etc. started in 2014–2017 with the possible consideration of the survey results of WP2, WP3, WP5, other surveys and interviews.

**Task 7.4.1.** *Innovation in Higher Education* conference and seminar, held on 16 June 2017 at DSTU.

**Task 7.4.2.** Workshop: “Formation of three levels of ICT competence of teachers, administrators, scientists by creating open educational e-environment and personal learning environment for student” (BGKU, Ukraine, 8 September 2017). Additionally, organisation of the 3<sup>rd</sup> International Scientific Conference *Open Educational E-environment of Modern University* (BGKU, Ukraine, 8 September 2017).

**Task 7.5.** *ICTE-2017* (OU, Czech Republic), held on 5–7 September 2017.

**Task 7.6.** Conference *Theoretical and Practical Aspects of Distance Learning – 2017 (Effective Developing Teachers' Skills in the Area of ICT and E-learning)* and workshop, held on 15–17 October 2017 in US, Poland.

**Task 7.7.** Final thoughts, conclusion, e-round table debate, and videoconference for all participants, held on 27 November 2017 and on 29 January 2018.

## Deliverables

**D 7.1.** *Innovation in Higher Education – 2017* Conference Proceedings (DSTU, UA, June–July 2017) was printed (Resp. prof. Maryna Romanyukha). Sadovoj, O. (Ed.). (2017). *Innovation in Higher Education / Інновації у вищій освіті*. Collection of Scholarly Papers of Dniprovsk State Technical University. Kam'ians'kie: DSTU, 2017.

**D 7.2.** A collection of theses: *Formation of three levels of ICT competence of teachers, administrators, scientists by creating open educational e-environment and personal learning environment for student* (BGKU, UA, September 2017) was printed (Resp. prof. Nataliia Morze) and is available on the website: <http://openedu.kubg.edu.ua/journal/index.php/openedu/issue/view/3/showToc>.

Morze, N., Makhachashvili, R., & Buinytska, O. (2017). *Open educational e-environment of modern university: Collected scientific works. Vol. 3*, ed. N. Morze. Kyiv: Borys Grinchenko Kyiv University [Відкрите освітнє е-середовище сучасного університету: Зб. наук. праць № 3 / ред. Морзе Н.В., Буйницька О.П. та ін.; за заг. ред. Морзе Н.В. Київ: Київ, Університет ім. Б. Грінченка, 2017]. Retrieved from <http://openedu.kubg.edu.ua/journal/index.php/openedu/issue/view/3/showToc>. The collection of papers was prepared in two language versions – Ukrainian and English. Indexed in ERIH PLUS, Google Scholar, Universal Impact Factor, Polska Bibliografia Naukowa, Research Bible, Eurasian Scientific Journal Index, Українські наукові журнали, Journal Impact Factor, Bielefeld Academic Search Engine, Socioindex.

**D 7.3.** *ICTE-2017 Conference Proceedings* (September 2017) (Resp. prof. Kateřina Kostolányová) are available in full electronic version. Kostolányová, K. (Ed.). (2017). Proceedings from *Information and Communication Technology in Education (ICTE-2017)*, 4–6 September 2017, Pedagogical Faculty, University of Ostrava, Ostrava.

**D 7.4.** Monograph *Effective development of teachers' skills in the area of ICT and e-learning* (US, Poland, December 2017) was printed (Resp. prof. Eugenia Smyrnova-Trybulska). Smyrnova-Trybulska, E. (Ed.). (2017). *Effective development of teachers' skills in the area of ICT and e-learning. Scientific monograph*. E-learning Publishing Series, Vol. 9. Katowice–Cieszyn: Studio Noa for University of Silesia.

The working paper on the effects of implementation of the project results: Smyrnova-Trybulska, E., Morze, N., Yakovleva, O., Issa, T., & Issa, Th. (2017). Some methodological aspects of MOOCs developing. In E. Smyrnova-Trybulska (Ed.), *Effective development of teachers' skills...* (pp. 139–158).

**D 7.5.** Monograph (updated title) *Universities in the networked society. Cultural diversity in learning communities*. Smyrnova-Trybulska, E., Kommers, P., & Malach, J. (Eds). (2018). *Universities in the networked society. Cultural diversity in learning communities*. International scientific monograph. Springer. In print. Scheduled delivery date: December 2018. Substantiation of delay in printing – the prestigious publishing house and a long reviewing procedure.

**D 7.6.** A jointly-written article for a leading journal or a chapter for a forthcoming volume resulting from the project to provide evidence-informed advice for university leadership and professional programmes (IJREL, US, Poland, or Springer monograph, 2018). The chapter is included in the monograph *Universities in the networked society. Cultural diversity in learning communities*.

1. Smyrnova-Trubulska, E. & Morze, N. (2018). Innovative MA programme “E-learning in Cultural Diversity.” In E. Smyrnova-Trybulska, P. Kommers, & J. Malach (Eds.), *Universities in the networked society...* [in print]
2. Kostolányová, K., Malach, J., Nagyová, I., Prextoová, T., & Chmura, M. (2018). Role of universities in process of digitalization of instruction and learning diversity. In: In E. Smyrnova-Trybulska, P. Kommers, & J. Malach (Eds.), *Universities in the networked society...* [in print]

**D 7.7.** A jointly-written article for a leading journal or a chapter for a forthcoming volume on teaching approaches that enhance / hinder students’ success in postgraduate studies, and on developing a tool kit on quality teaching in higher education with the focus on promoting participation, retention, and success by target equity groups. The article was prepared and printed: Morze, N., Kuzminska, O., & Liakh, T. (2017). Development of educational, scientific collaboration and project management with IC tools in universities. In E. Smyrnova-Trybulska (Ed.), *Effective development of teachers’ skills...* (pp. 347–364).

**D 7.8.** Report reviewing the scientific results of the Work Packages 6 and 7, practical arrangements and actions for joint projects, and further long-term collaboration were prepared.

**In the framework of the DLCC2017 conference in Cieszyn, US, Poland, on 17 October 2017 an e-round table debate was conducted** with participation of IRNet researchers and external experts. Moderators of the debate were Eugenia Smyrnova-Trybulska and Magdalena Roszak. In the framework of this conference and debate, results of the IRNet project were discussed and presented:

1. teachers’ and learners’ digital skills in different countries – formal regulation and informal approach; teachers’ skills and ICT competencies in e-learning; recommendations;
2. the quality of e-learning and ICT competences of teachers – ways of increasing their effectiveness;
3. innovative specialisations and MA programmes at partner universities in 2014–2017;
4. internalisation of higher education; presence and future internalisation at partner universities; and
5. from traditional university to open and smart university – suggestions and recommendations.

The more important of the research results are:

- elaborating the MOOCs “ICT tools for e-learning” (<http://el.us.edu.pl/irnet/>);
- developing a new international MA programme: E-learning in Cultural Diversity;
- submission of the application proposal in the framework of EMJMD, Erasmus Mundus (Reference number 599281-EPP-1-2018-1-PL-EPPKA1-JMD-MOB), with participation of IRNet partners as well as new partners – HEIs and companies;
- winning the grant No. 21720008 entitled “High school teacher competence in change” (<https://www.visegradfund.org/archive/results/visegrad-grants/>);

- starting and developing the new project **International Journal of Research in E-learning** (<http://weinoe.us.edu.pl/nauka/serie-wydawnicze/international-journal-research-e-learning>), peer-reviewed journal, ISSN 2451-2583 (Print) ISSN 2543-6155 (Online), **indexed in** ICI Journals Master List – Index Copernicus (82.36 pkt); ERIH+; the Central and Eastern European Online Library CEEOL; Academic Research Index <https://www.researchbib.com/>; Google Scholar; JIFACTOR.ORG; CEJSH; BazHum; Polska Bibliografia Naukowa <https://pbn.nauka.gov.pl>; Journal Factor; and
- International Master’s Degree programme, developed in cooperation with:
  - the University of Silesia in Katowice, Poland;
  - the University of Extremadura, Spain;
  - the Eastern Macedonia and Thrace Institute of Technology, Kavala, Greece;
  - the Kaunas University of Technology, Lithuania;
  - the ISMA University, Riga, Republic of Latvia; and
  - the Borys Grinchenko Kyiv University, Ukraine.
 Associated partners include:
  - Instituto Politécnico de Santarém / The Higher School of Education, Portugal;
  - University of Aveiro, Portugal;
  - International School for Social and Business Studies, Slovenia;
  - the Curtin University, Australia;
  - the Georgian Technical University, Georgia;
  - the Palestine Technical University, Palestine;
  - Helix5, the Netherlands;
  - IADIS, Portugal; and
  - StartinForum Uluslararası Danışmanlık Ticaret LTD Şirketi, Turkey.

## Secondments

### **Secondment of the University of Extremadura (UEx), the University of Ostrava (OU) to the Herzen State Pedagogical University of Russia (HSPU) (April–May 2017)**

This secondment is described in the previous issue of the *International Journal of Research in E-learning*: see *International Journal of Research in E-learning*, 3(2), 2017, 109–110.

### **Secondment of the Borys Grinchenko Kyiv University (BGKU), HSPU, the Dnieprodzerzhinsk State Technical University (DSTU) to OU (May, June–July 2017)**

This secondment is described in the previous issue of the *International Journal of Research in E-learning*: see *International Journal of Research in E-learning*, 3(2), 2017, 110–111.

### **Secondment of the University of Silesia in Katowice (US), OU to the BGKU (June–July 2017)**

The transfer of knowledge activities during this secondment was focused on the dissemination of the research results, in particular MOOCs “ICT tools for



e-learning,” the new MA programme: E-learning in Cultural Diversity, the new issue of *International Journal of Research in E-learning*, and other research results in the Ukrainian academic scientific environment. The following workshops were conducted:

1. 19 June 2017 – IRNet seminar at the South Ukrainian National Pedagogical University named after K. D. Ushynsky in Odessa. Meeting with first Vice-Rector prof. Olga Antonivna Kopus, Vice-Rector for Educational Work prof. Fedir Ivanovych Kazanzhy, and Chief of the International Department Svetlana Skorokhod. IRNet research results were presented there. Participants: prof. Eugenia Smyrnova-Trybulska, prof. Ewa Ogrodzka-Mazur, prof. Anna Szafrńska-Gajdzica, prof. Barbara Grabowska, dr Łukasz Kwadrans (US, Poland); dr Milan Chmura (OU, Czech Republic), prof. Nataliia Morze, dr Tetiana Liakh (BGKU, Ukraine).
2. 20 June 2017 – meeting with the Head of Primary Mathematics Education department of South Ukrainian National Pedagogical University named after K. D. Ushynsky in Odessa, prof. Svetlana Skvortsova, seminar with staff members of Primary Mathematics Education Department on ICT in primary mathematics education, and discussion about strengthening the cooperation in the framework of joint research and projects.
3. 21 June 2017 – Master thesis presentation at the Institute of Pedagogy, BGKU. Coordinator: prof. Nataliia Morze; participants: prof. Eugenia Smyrnova-Trybulska, prof. Ewa Ogrodzka-Mazur, prof. Anna Szafrńska-Gajdzica, prof. Barbara Grabowska, dr Łukasz Kwadrans, dr Milan Chmura. At the Institute of Pedagogy there was also PhD thesis presentation supervised by prof. Nataliia Morze.
4. 22 June 2017 – Master thesis presentation on ICT in foreign languages in intercultural communication, Institute of Philology. The coordinator and organiser of the presentation was prof. Rusudan Makhachashvili. Participants: prof. Smyrnova-Trybulska, prof. Ogrodzka-Mazur, prof. Szafrńska-Gajdzica, prof. Grabowska, dr Kwadrans, dr Chmura.
5. 22 June 2017 – IRNET project seminar on WP7 objectives, tasks, deliverables, methodology, and road map, conducted by prof. Eugenia Smyrnova-Trybulska. Participants: prof. Smyrnova-Trybulska, prof. Ogrodzka-Mazur, prof. Szafrńska-Gajdzica, prof. Grabowska, dr Kwadrans, dr Chmura.
6. 23 June 2017 – a visit to Chernihiv National Pedagogical University. Meeting with Dean of the Faculty of Information Technology doc. Eugenij Vinnichenko, Head of the Department prof. Yuriy Goroshko, authors of Gran Programme for support of mathematics teaching. Project seminar concerned ICT in teaching mathematics, and was conducted by prof. Goroshko and doc. Vinnichenko.
7. 26 June 2017 – IRNet project monthly videoconference: Project Meeting and Seminar on WP7 (in presence and online) conducted by prof. Eugenia Smyrnova-Trybulska. Participants: prof. Smyrnova-Trybulska, prof. Ogrodzka-Mazur, prof. Szafrńska-Gajdzica, prof. Grabowska, dr Kwadrans, dr Chmura.

8. 27 June 2017 – project seminar: “ICT tools for collaboration and project management.” Online pilot course test-run presentation was conducted by dr Tetiana Liakh, prof. Rusudan Makhachashvili, and dr Iryna Vorotnikova. Prof. Smyrnova-Trybulska, prof. Ogrodzka-Mazur, prof. Szafrńska-Gajdzica, prof. Grabowska, dr Kwadrans, and dr Chmura participated in the event.
9. 28 June 2017 – project seminar on the new European MA programme degree with participation of researchers from different countries and universities: University of Silesia in Katowice (Poland), University of Extremadura (Spain), Borys Grinchenko Kyiv University (Ukraine), Carinthia University of Applied Sciences (Austria), Palestine Technical University, Palestine, Tbilisi Technical University (Georgia), Curtin University (Australia), University in Almeria (Portugal), and Kaunas Technical University (Lithuania).
10. 29 June 2017 – seminar: “Applied and digital humanities education vision in inter-cultural environment,” conducted by prof. Rusudan Makhachashvili, dr Yuliya Shtaltovna. Participants: prof. Smyrnova-Trybulska, prof. Ogrodzka-Mazur, prof. Szafrńska-Gajdzica, prof. Grabowska, dr Kwadrans, dr Chmura.

### **Secondment of UEx to Curtin University (CU) (June–July 2017)**

The transfer of knowledge activities during this secondment was focused on the dissemination of the project outcomes. The following workshops and other events took place:

1. 6 June 2017 – meeting for Erasmus Mundus MA programme discussion through Adobe Connect. The goals of this activity were to clear up some important points about participation, and dates involved the presentation of the Erasmus Mundus Masters Design in the European Union institution.
2. 6 June 2017 – meeting for planning Perth visit regarding all the works involved in WP7. The goals of this action were to discuss the State of the MOOC development and other ongoing tasks within the topics of research projects, and to know the development and studies that have to be developed for the Erasmus Mundus Master Programme. The agenda was reviewed with Tomayess Issa.
3. 7 June 2017 – meeting for preparing seminars that would be performed after Curtin University exam period. The goal was to design the presentations of current research projects for PhD students of the Curtin School of Information Systems. The presentations were matched to the time and objectives established in the agenda.
4. 9 June 2017 – research and personal work. The goals of this action were to work on presentations for students and to discuss best proposals for getting the objectives.
5. 12 June 2017 – Adobe Connect meeting of the Spanish team. The goals of this action were to take decisions about the commitment of the University of Extremadura with the Erasmus Mundus Master Programme. There were some confusing points that had to be cleared up by the project coordinator prof. Smyrnova-Trybulska.



6. 13 June 2017 – the Spanish team meeting for discussing future IRNet research trips. The goal of this discussion was to plan future research trips of the Spanish team, in accordance with the last events related to some of our members. Some trips had to be rescheduled very quickly. The new plan included some important points about visa, flights, invitation letters, etc.
7. 14 June 2017 – meeting for re-scheduling events at Curtin University. The Spanish team members met with Tomayess Issa for important changes in the agenda. The goals were to get to know the innovations of Central Perth as an industry and research collaboration centre at Curtin University, established by Cisco in collaboration with foundation partners, such as Curtin University and Woodside Energy.
8. 28 June 2017 – meeting in Counselling Services. The goal was to know the model that the Counselling Services team offers to Curtin staff and students, in order to make a safe professional environment to deal with any issues affecting work or study.
9. 28 June 2017 – meeting with PhD and MA students. The goals were to present: “University of Extremadura. Research projects,” “Collaborative learning: theoretical and practical framework,” and “Measurement of Digital Storytelling outcomes in classrooms.”

#### **Secondment of BGKU to UEx (June–July 2017)**

The transfer of knowledge activities during this secondment was focused on the dissemination of project results. In the framework of WP7 the following tasks were conducted:

1. 29 June 2017 – IRNet project meeting and seminar at the University of Extremadura, Department of Pedagogy, moderated by prof. Prudencia Gutiérrez Esteban. The meeting centred on the visit to Badajoz schedule, the objectives and nearest deadlines of the WP7 delivery, discussion of a joint article, and conducting a questionnaire with the researchers from the University of Extremadura.
2. 6 July 2017 – IRNet project meeting and seminar at the University of Extremadura, Department of Pedagogy, moderated by prof. Sixto Cubo Delgado. The BGKU team took part in the discussion of the PhD research methodology and methodical premise within the e-learning context.

#### **Secondment of BGKU to Lusiada University (LU) (July 2017)**

1. 7 July 2017 – IRNet project meeting at Lusiada University campus, conducted by prof. Paulo Pinto and prof. António Reis; a visit to the ICT research and study centre for students; a visit to the in-service ICT conferencing and lecturing facilities. An account of conference recording and broadcasting ICT tools was made.
2. 10 July 2017 – IRNet project meeting at Lusiada University, moderated by prof. Pinto. The meeting centred on: the visit to Lisbon schedule; the objectives and nearest deadlines of WP7 delivery; discussion of a joint article; conducting

a questionnaire with the researchers from Lusiada University; and detailing the nature of national and international concepts outlined above for important purposes of the higher education sector and the relationship between the institution / sector and wider policy in Poland, the Netherlands, Spain, Slovakia, the Czech Republic, Portugal, Australia, Ukraine, and Russia.

### **Secondment of US, Constantine the Philosopher University (UKF), LU, UEx to BGKU (August–September 2017)**

The transfer of knowledge activities during this secondment was focused on the dissemination of research results, in particular MOOCs “ICT tools for e-learning,” the new MA programme: E-learning in Cultural Diversity, the new issue of *International Journal of Research in E-learning*, among the Ukrainian academic scientific environment.

1. 29 August 2017 – IRNet seminar with the participation of the researchers from US, Poland, LU, Portugal, UEx, Spain, BGKU, Ukraine, at BGKU.
2. 1 September 2017 – Master students seminar “IT in communication redefinition framework” with the participation of the IRNet researchers from the abovementioned educational institutions, held at BGKU.
3. 1 September 2017 – project seminar with the participation of the IRNet researchers from the abovementioned educational institutions, held at BGKU.
4. 2 September 2017 – Conference *Braine&Ukraine*, with the participation of the IRNet researcher and coordinator prof. Smyrnova-Trybulska, held in Kiev.
5. 4 September 2017 – videoconference, project meeting, and seminar on WP7, with the participation of IRNet researchers, conducted by prof. Smyrnova-Trybulska.
6. 5 September 2017 – individual research programme; preparing the article: “Information technologies in the operation of primary schools” for the 9<sup>th</sup> volume of the *E-learning* series: *Effective development of teachers' skills in the area of ICT and e-learning*.
7. 6 September 2017 – round table debate with the participation of IRNet researchers, BGKU.
8. 6 September 2017 – project seminar and workshop with the participation of IRNet researchers, BGKU.
9. 6 September 2017 – visit in the Bilingual School (Spanish–English) with the participation of IRNet researchers, BGKU.
10. 6 September 2017 – visit to the SMART Lab and project seminar with the participation of IRNet researchers, BGKU.
11. 7 September 2017 – visit in the Unit Factory with the participation of IRNet researchers, BGKU.
12. 8 September 2017 – *Open E-environment of the Modern University* Conference, with the participation of IRNet researchers from BGKU, US, PL, UKF, SK, LU, PT, UEx, ES, BGKU, and UA. In the framework of the conference were held a lot different activities, including:

- a) a round table debate: “Discussion panel. Open education – myth or reality? Trends in modern education”;
- b) Panel 1. “E-university: Technologies and development tools”;
- c) during the conference, there were a number of IRNet researchers’ presentations:
- “Creating modern cloud-oriented personalized education environment taking into consideration educational process participants’ ICT competencies,” Nataliia Morze, Svitlana Spivak;
  - “LMS MOODLE tools inventory implementation to assure quality in-service teacher training,” Iryna Vorotnykova;
  - “Lifelong learning – A local case of success using web text-based discussion forums,” Isabel Alvarez, Paulo Pinto, Nuno Sotero da Silva;
  - “Networking is one of the effectiveness form of the international research. Some aspects,” Eugenia Smyrnova-Trybulska;
  - “The ICT potential for teaching sociological courses,” Oksana Shelomovska, Liudmyla Sorokina, Maryna Romaniukha, Kostiantyn Bohomaz;
  - “Digital storytelling and technologies,” António dos Reis;
  - “Formation students’ ICT competence: Case study,” Nataliia Morze, Olha Barna, Olena Kuzminska, Viktoriia Vember;
  - “Educational e-environment of modern university: Foreign experts’ perspective,” Nataliia Morze, Ewa Ogrodzka-Mazur, Paulo Pinto, Olena Glazunova, Josef Malach, Valeria Zabolotna, Nadiia Balyk;
  - “Students standing before the distance learning in institution of higher education,” Tetiana Liakh, Tetiana Spirina, Alona Popova;
  - “A way to measure complex concepts relationships when using digital storytelling,” Rafael Martin Espada, Juan Arias Masa, Sixto Cubo Delgado, Gemma Delicado Puerto, Prudencia Gutierrez Esteban, Laura Alonso-Díaz, Rocio Yuste Tosina; and
  - “Introduction to learning analytics adoption in higher education institutions,” Martin Drlík, Peter Švec, Martin Cápaj, Júlia Tomanová;
- d) Additionally, IRNet researchers took part in several workshops:
- “Robot programming mBot,” conducted by Sergey Dziuba;
  - “Potentialities in using LMS MOODLE to build up students’ competencies,” moderator: Liliia Varchenko-Trotsenko;
  - “Increase the digital capabilities of the teacher with the services, Google resources. Effective mobility,” moderator: Nataliia Sarzhynska;
  - “Gamification at primary school,” moderator: Artur Kocharyan;
  - “New Masters’ program: E-Learning Management,” moderators: Nataliia Morze, Olena Kuzminska.

### **Secondment of UEx, LU, OU to HSPU (August–September–October 2017)**

The transfer of knowledge activities during this secondment was focused on the dissemination of IRNet project results (WP7). The main activities were:

1. 23 August 2017 – meeting with the participation of Rafael Martín and Juan Arias for progressing on Digital Storytelling MOOCs.
2. 25 August 2017 – meeting and discussion on preparing articles for ICTE-2017 Conference proceedings (D 7.3) and for the monograph *Effective development of teachers' skills in the area of ICT and e-learning* (D 7.4.)
3. 28 August 2017 – meeting and discussion on preparing a paper for *Comunicar* journal about Digital Storytelling and means of measuring the learning improvement as part of the dissemination of results of the IRNet project; analysing test results.
4. 22 September 2017 – workshop and seminar on the IRNet research for students and future teachers of ICT and informatics, within the course named “ICT in natural science education.” In this seminar, they conducted a test aiming to determine the similarity between the concepts related to ICT and education. Some tools for qualitative analysis such as MEBA and webQDA were shown. Workshop and seminar were conducted by prof. Juan Arias and prof. Rafael Espada.
5. 25 September 2017 – workshop and seminar for Herzen University teachers on analysing test results, conducted by prof. Arias and prof. Espada. Objectives: reviewing the main aspects of the University of Extremadura research and planning possible collaboration projects for testing learning improvement in pilot teaching.
6. 26 September 2017 – seminar in Saint Petersburg State University about measuring learning improvement when using Digital Storytelling, conducted by Elena Gaevskaia. The aim of the project was to analyse the students' learning improvement of Information and Educational Centre “The Russian Museum: the Virtual Branch.” Workshop and seminar were conducted for Spanish students through Adobe Connect in order for them to do the same test as Russian students and compare the results on the perception of ICT and education.
7. 28 September 2017 – seminar for showing provisional results to the Russian team, further discussions and planning the next test, and reviewing the conditions for using software tools in new projects, with the participation of the IRNet researchers from UEx and HSPU.

### **Secondment of BGKU, HSPU, DSTU to US (September–October–November 2017)**

The transfer of knowledge activities during this secondment was focused on the dissemination of project results in the framework of WP7. The main activities were:

1. 24 September 2017 – meeting with the Minister of National Education in Poland, Anna Zalewska, and discussion of joint research in elementary and secondary school.
2. 25 September 2017 – meeting with the Mayor of Świebodzice, Bogdan Kożuchowicz, and discussion of joint projects on vocational education.

3. 4 October 2017 – scientific seminar, organised by the Department of Humanistic Education and Auxiliary Sciences of Pedagogy. Lectures: Dr Anna Porczyńska-Ciszewska, “Personal conditions of mental well-being – methodology of tests from the perspective of positive psychology”; mgr Ryszard Kalamarz, “E-learning in the acquisition of the ability to communicate in foreign languages as a key competence within the framework of academic foreign language teaching (on the example of tertiary-level English language classes).”
4. 8 October 2017 – seminar “Features of integration training in junior high schools: Experience of Poland and Ukraine.” Moderators: prof. Anna Szafrąska-Gajdzica, prof. Barbara Grabowska.
5. 11 October 2017 – guest lecture and IRNet project seminar by prof. Piet Kommers, “Cognitive support through social media for multi-culture in international student exchange.” The issues taken into consideration were: the structure of cognitive competence, cognitive competence in intercultural environment, conceptual competence development through social media, redefinition and reconceptualisation in digital age.
6. 11 October 2017 – IRNet project meeting at the University of Silesia, Faculty of Ethnology and Sciences of Education. Moderator: prof. Eugenia Smyrnova-Trybulska; participants: prof. Natalia Morze, prof. Rusudan Makhachashvili, prof. Tetiana Liakh (BGKU), prof. Tatiana Noskova, dr Tatiana Pavlova (HSPU), prof. Marina Romanyukha, and prof. Lyudmila Sorokina (DSTU). The meeting centered on the schedule of the visit to the University of Silesia, and on setting up the objectives and nearest deadlines of WP7 delivery. Other activities included: a meeting with the Head and employers of Department of Special Pedagogy; a briefing on the structure and on the educational standards in the University of Silesia in Katowice and Poland in the wider context of IRNet project objectives; a discussion on the extensive study of feminist narratives in the wider scope of intercultural competences development.
7. 15 October 2017 – Management Board Meeting of IRNet team coordinators; *Theoretical and Practical Aspects of Distance Learning 2017* Conference opening dinner (Kamienica Konczakowskich Restaurant).
8. 16–17 October 2017 – 9<sup>th</sup> Annual International Scientific Conference *Theoretical and Practical Aspects of Distance Learning 2017 (Effective Development of Teachers’ Skills in the Area of ICT and E-learning)* (<http://www.dlcc.us.edu.pl/>) and workshop.
  - 21 IRNet presentations: “Evolution part I - From Socrates behaviourism to digital constructivism” (US, BGKU, HSPU); “Learning paradigms as input parameter for educational leadership” (UT); “Glossary of terms for ICT and e-learning: Comparison of the Polish, Spanish and Russian approach” (US, UEx, HSPU); “Evolution part II - Disruptive Innovation in the school of the future with a focus in ‘flipped classroom’” (Portugal); “Some trends of ICT tools application by teachers: A comparative study of Russian and

- Spanish experience” (UEX, HSPU); “Development of educational, scientific collaboration and project management with IC tools in universities” (BGKU); “Network communication as a means of improving the efficiency of teacher-student interaction” (DSTU); “The use of electronic educational resources in the didactic activities of academic teachers” (US); “Innovations In technical sciences as a tool of popularizing distance education” (DSTU); “How to reduce differences between requirements of modern LMS and their real use” (UKF); “Education of school staff for digital teaching and learning” (OU); “ICT, e-learning, DL, intercultural competences thesaurus structure modelling recommendations” (BGKU); “Information Technologies in the operation of primary schools” (US); “E-pedagogy and e-learning” (BGKU); “Designing the syllabus of the course Internet Technologies in Translation with the reference to the translation competences and challenges of the market” (Turkey); “Lifelong learning – Cultural and ethical impacts” (LU); “Formative and peer assessment in higher education” (BGKU); “Use of bot-technologies for educational communication at the university” (BGKU); “Didactical aspects of test creation: Theoretical component” (DSTU); “Some methodological aspects of MOOCs developing” (US, BGKU, HSPU, CU); and an “E-round table debate” (US, UKF, BGKU, DSTU, UT, OU, RMIT).
9. 17 October 2017 – e-round table debate with the participation of IRNet researchers and external experts. Moderators: Eugenia Smyrnova-Trybulska and Magdalena Roszak. The issues discussed were:
    - a) teachers’ and learners’ digital skills in different countries – formal regulation and informal approach; teachers’ skills and ICT competencies in e-learning: recommendations;
    - b) the quality of e-learning and ICT competences of teachers – ways of increasing effectiveness;
    - c) innovative specialisations and MA programmes at your university in 2014–2017;
    - d) internationalisation of higher education; presence and future internationalisation at your university; and
    - e) from traditional university to open and smart university – suggestions and recommendations.
  10. 17 October 2017 – Conference workshop and debate “How to implement a flipped classroom,” conducted by prof. António dos Reis, prof. Nataliia Morze, and prof. Olga Yakovleva. Subjects of study were: how to organise your students according to learning styles; teacher’s digital skills to be used in the school of the future.
  11. 18 October 2017 – lecture “Media for communication and education,” conducted by prof. Piet Kommers. Issues addressed were: communicative spin on education in the 21<sup>st</sup> century; philosophic paradigms of communication in



- education; synergy of media and message in education; and communicative competences development through digital media.
12. 18 October 2017 – Summer Young Educators Conference (<http://www.us.edu.pl/xxx-letnia-szkola-mlodych-pedagogow>) with the participation of IRNet researchers.
  13. 23 October 2017 – IRNet project seminar on the dissemination of WP7 results. Moderator: prof. Smyrnova-Trybulska; participants: prof. Smyrnova-Trybulska, prof. Morze, prof. Makhachashvili, prof. Liakh, prof. Noskova, dr Pavlova. The partnership's expected contribution to the area of collaboration was determined to be as follows:
    - a) a dataset for the analysis of the development effect of ICT, e-learning, and intercultural competences in different EU countries;
    - b) a literature and IT tools review and an analysis of their place and level in European educational systems and in the countries of project partners; study of the arrangements of different types of temporary work contracts as implemented in each of the EU countries; and
    - c) a detailed ICT and intercultural competences development methodology for the evaluation of the network research effect in educational institutions of different EU countries.
  14. 24 October 17 – project lecture and workshop by dr Maria Stec, US, “Multimodality in foreign language acquisition”; participants: prof. Makhachashvili, prof. Liakh, prof. Noskova, dr Pavlova. The issues discussed were: multimodality and multimediality in cross-cultural communication, iconicity in e-environment, communication multimodality premises, and multimodality and paraverbal media.
  15. 25 October 17 – meeting with the students of the Faculty of Ethnology and Sciences of Education, US, Poland, and a lecture “21<sup>st</sup> century competences development and the applied educational strategy of BGKU” given by prof. Rusudan Makhachashvili.

#### **Secondment of BGKU to LU (November–December 2017)**

1. 26 November 2017 – IRNet project meeting moderated by prof. Paulo Pinto; participants: prof. Rusudan Makhachashvili, prof. Isabel Alvarez; the meeting centred on the visit to LU schedule, and on setting up the objectives and nearest deadlines of WP7 delivery.
2. 27 November 2017 – IRNet project seminar, moderated by prof. Smyrnova-Trybulska; participants: prof. Morze, prof. Makhachashvili, prof. Liakh, prof. Noskova, dr Pavlova, prof. Romanyukha, and prof. Lyudmila Sorokina. The issues and tasks tackled were:
  - a) road map implementation, objectives, task, deliverables, methodology, discussion with the participation of all team coordinators and researchers, and their reports about the work progress; filling the WP7 tables (1–7)

- with results by coordinators or responsible persons (all teams coordinators participated);
- b) MOOC “ICT tools for e-learning” – the final stage of elaboration, reports of team coordinators (deadline – 27 November 2017, start for focus groups – the end of November 2017); report of the group coordinators and the experts on MOOC’s quality (responsible representative researchers from every team); tools and criteria for assessment of modules; analysing the results of assessment of every module via survey filling;
  - c) recording the MOOC promotion video for every module by the responsible person (recommended according to the template available on Google Drive), completing the methodological recommendations;
  - d) MA programme E-learning in Cultural Diversity, Erasmus Mundus Project – preparing documentation of an international MA course on E-learning in Cultural Diversity.
3. 29 November 2017 – three guest project workshops entitled “Applied strategies in communication education” at Lusiada University. The issues discussed were: the structure of communicative competence, communicative competence in intercultural environment, communication models in digital age, and BGKU applied strategy in communiative studies implementation.
  4. 30 November 2017 – IRNet project seminar moderated by prof. António dos Reis, “Digital skills developmet. Profiling, script and production of didactic video for crucial digital skills development – ICT tools for word cloud elaboration” (<https://youtu.be/AfQ3ZX-hEdg>).
  5. 4 December 2017 – IRNet project seminar moderated by prof. António dos Reis, “Digital skills frameworks comparative analysis. Profiling, script and production of didactic video for crucial digital skills development.”
  6. 7 December 2017 – IRNet project seminar for faculty, in-service teachers, and students “Communication in digital age”; moderator – prof. Pinto.
  7. 8 December 2017 – IRNet project seminar moderated by prof. António dos Reis, “Digital skills elaboration and implementation. Profiling, script and production of didactic video for crucial digital skills development – ICT tools for text mining and corpus analysis.”

### **Secondment of US, OU, University of Twente (UT) to CU (November–December 2017)**

The transfer of knowledge activities during this secondment was focused on: research results; selected results of the project, in particular the implementation of MOOC “ICT tools for e-learning,” a new master’s programme E-learning in Cultural Diversity; and preparation of an application for obtaining an Erasmus Mundus EMJMD grant. The work also concerned the dissemination of scientific journals among the international academic community. The journals discussed were: *International Journal of Research in E-learning (IJREL)* (<http://weinoe.us.edu.pl/nauka/serie-wydawnicze/international-journal-research-e-learning>), indexed



in ERIH+, IndexCopernicus and 10 other scientific databases; *Open E-environment of the Modern University*, indexed in ERIH+ and 9 other scientific databases; and the “E-learning” series (<http://weinoe.us.edu.pl/nauka/serie-wydawnicze/seria-e-learning/seria-e-learning>).

1. 17 November 2017 – IRNet project meeting and seminar with the participation of the researchers from US, OU, UT, and CU at Curtin University, conducted by prof. Smyrnova-Trybulska.
2. 20 November 2017 – IRNet project meeting, workshops, and seminar conducted by prof. Smyrnova-Trybulska, with the participation of the researchers from the abovementioned institutions at Curtin University.
3. 23 November 2017 – IRNet e-round table debate with the participation of the researchers from the abovementioned institutions at Curtin University.
4. 23 November 2017 – IRNet workshop on MOOC in education, conducted by prof. Piet Kommers, and round table debate with the participation of the researchers from the abovementioned institutions at Curtin University.
5. 23 November 2017 – IRNet Seminar on WP7 and MOOC’s improvement and evaluation, conducted by prof. Smyrnova-Trybulska, with the participation of the researchers from the abovementioned institutions at Curtin University. The objectives were: an analysis of the focus groups and certification of the participation on MOOC, and perspectives and direction of improving the MOOC.
6. 23 November 2017 – IRNet project meeting, seminar, and workshop on preparing new project proposals for Erasmus Mundus and Erasmus+ (KA2), with the participation of the researchers from the abovementioned institutions at Curtin University.
7. 23 November 2017 – recording the IRNet promotion and didactic video with the participation of researchers at the Curtin University.
8. 27 November 2017 – workshop, meeting, and seminar on the innovative MA programme in the area of e-learning and intercultural competences conducted by prof. Demetrios Sampson and prof. Smyrnova-Trybulska, with the participation of the researchers from the abovementioned institutions at Curtin University.
9. 27 November 2017 – IRNet project meeting and e-round table debate with the participation of the researchers from the abovementioned institutions at Curtin University.
10. 27 November 2017 – recording the didactic and promotion video as well as a didactic video for MOOC “ICT tools for e-learning,” with the participation of the researchers from the abovementioned institutions at Curtin University.
11. 27 November 2017 – monthly project meeting in presence and remote mode, and videoconference conducted by prof. Smyrnova-Trybulska, with the participation of the researchers from the abovementioned institutions at Curtin University. Photo reportage available on: <http://www.irnet.us.edu.pl/gallery/monthly-project-meeting-and-videoconference>.

12. 29 November 2017 – meeting of IRNet researchers from UT, US, CU with Staff and PhD students of Curtin University, and workshop on the dissemination of WP7, conducted by prof. Smyrnova-Trybulska.
13. 29 November 2017 – IRNet seminar and workshop “The role of visual materials in teaching,” conducted by dr Maria Stec (US), with the participation of the researchers from the abovementioned institutions at Curtin University.
14. 29 November 2017 – IRNet seminar and workshop “Self-learning strategies,” conducted by dr Anna Studenska (US), with the participation of the researchers from the abovementioned institutions at Curtin University.
15. 4 December 2017 – meeting with authorities and staff of the School of Information Systems (School IS). During the meeting with the participation of IRNet researchers, the discussion focused on joint research; preparation of new application proposals for win the grants for a new project – EU and Australia; MA course degree study; Erasmus Mundus, Erasmus + (KA2); joint MOOC “ICT tools for e-learning.” Participants of the meeting analysed agreements – Teaching and Research, exchange of University staff (academic teachers, researchers) and students.
16. 11–13 December 2017 – participation in the *International Conference on Educational Technologies (ICEduTech 2017)*, Western Sydney University, Sydney, Australia, with the following presentations: “Bibliometric science mapping as a popular trend: Chosen examples of visualisation of International Research Network results” (Eugenia Smyrnova-Trybulska), “Pilot verification of ‘Tools for adaptive learning’ module by PhD students at University of Ostrava” (Malach, J., Prextová, T., Chmura, M., Kostolányová, K.).

## Conferences

1. 1–12 April 2017 – *New Educational Strategies in Modern Information Space*, the Herzen State Pedagogical University of Russia, Saint Petersburg, Russia, with the participation of approximately 75 participants from different countries.
2. 16 June 2017 – 3<sup>rd</sup> International Scientific Conference *Innovations in Higher Education*, Dniprovsk State Technical University, Dniprodzerzhinsk, Ukraine, with the participation of approximately 40 participants.
3. 4–6 September 2017 – *ICTE2017*, University of Ostrava, the Czech Republic, with 75 participants from different countries.
4. 8 September, 2017 – 3<sup>rd</sup> International Scientific Conference *Open Educational E-environment of Modern University*, Borys Grinchenko Kyiv University, Ukraine, with approximately 100 participants.
5. 15–17 October 2017 – International Scientific Conference *DLCC2017* ([www.dlcc.us.edu.pl](http://www.dlcc.us.edu.pl)) *Theoretical and Practical Aspects of Distance Learning 2017 (Effective Development of Teachers’ Skills in the Area of ICT and E-learning)*, University of Silesia in Katowice, Cieszyn and Katowice, Poland, with the participation of more than 96 participants from more than 10 countries and

from more than 20 universities. Within the framework of the conference several events particularly connected with IRNet activities were held.

### Publications

- 1) Smyrnova-Trybulska, E., Morze, N., Kommers, P., Zuziak W., & Gladun, M. (2017). Selected aspects and conditions of the use of robots in STEM education for young learners as viewed by teachers and students. *Interactive Technology and Smart Education*, 14(4), 296–312.
- 2) Smyrnova-Trybulska, E., Kuzminska, O., & Morze, N. (2017). Flipped learning: Learning based on students experience. In K. Kostolányová (Ed.), *Proceedings from Information and Communication Technology in Education 2017*, Ostrava, Czech Republic, 4–6 September 2017 (pp. 64–69). Ostrava: Ostrava University.
- 3) Smyrnova-Trybulska, E., Kuzminska, O., & Morze, N. (2017). Flipped learning model: Tools and experience of its implementation in higher education. *The New Educational Review*, 49(3), 189–200.
- 4) Smyrnova-Trybulska, E., Morze, N., & Glazunova, O. (2017). Design of a university learning environment for SMART education. In T. Issa, P. Kommers, T. Issa, P. Isaiás, & T. B. Issa (Eds.), *SMART technology applications in business environments* (pp. 221–248). IGI Global. Chapter 11 DOI: 10.4018/978-1-5225-2492-2.ch011.
- 5) Smyrnova-Trybulska, E., Kommers, P., Morze, N., Pavlova, T., & Sekret, I., (2017). Using effective and adequate IT tools for developing teachers' skills. *International Journal of Continuing Engineering Education and Lifelong Learning*, 27(3), 219–245.
- 6) Smyrnova-Trybulska, E., Drlík, M., Švec, P., Kapusta, J., Munk, M., Noskova, T., Pavlova, T., Yakovleva, O., & Morze, N. (2017). Identification of differences in university e-environment between selected EU and non-EU countries using knowledge mining methods: Project IRNet case study. *International Journal of Web Based Communities*, 13(2), 236–261. DOI: 10.1504/IJWBC.2017.10004116.
- 7) Smyrnova-Trybulska, E. & Zuziak, W. (2017). Podejście inżynierskie w nauczaniu. *Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki Politechniki Gdańskiej*, 52, 125–130.
- 8) Smyrnova-Trybulska, E. & Zuziak, W. (2017). Zanâtiâ po robototehnike v osnovnoj škole – inženernyj podhod v obučenii i razvitie kompetentnostej. In *Proceedings from New Information and Communication Technologies in Education NOTO2017 /Novye informacionnye tehnologii v obrazovanii i nauke: NITO2/* (pp. 332–337). Yekaterinburg: Russian State Vocational and Pedagogical University.
- 9) Smyrnova-Trybulska, E. (2017). Mapping and visualization of scientific bibliometric domains and research network activities. In M. Hruby (Ed.), *Proceedings*

- from *Distance Learning, Simulation and Communication DLSC2017*, Brno, Czech Republic, 31 May – 2 June 2017 (pp. 301–308). Brno: University of Defence.
- 10) Smyrnova-Trybulska, E., Kommers, P., Morze, N., Gladun, M., & Zuziak, W. (2017). Robotics in primary school in the opinion of prospective and in-service teachers. A comparison study. *International Journal of Continuing Engineering Education and Lifelong Learning*, 27(4), 318–338.
  - 11) Smyrnova-Trybulska, E. (2016). Some aspects of activities in the e-learning environment for academic teachers – a research report. *Edukacja Ustawiczna Dorosłych / Polish Journal of Continuing Education*, 4, 15–26.
  - 12) Smyrnova-Trybulska, E., Morze, N., & Pavlova, H. (2017). Quality hybrid education evaluation: Academic staff performance assessment (Cases: Borys Grinchenko Kyiv University and the University of Silesia). *ICTEJournal*, 6(1), 25–34. DOI: 10.1515/ijicte-2017-0003.
  - 13) Smyrnova-Trybulska, E. (Ed.). (2017). *Effective development of teachers' skills in the area of ICT*. E-learning series, volume 9. Katowice–Cieszyn: Studio Noa for University of Silesia.
  - 14) Smyrnova-Trybulska, E., Stec, M., Studenska, A., Noskova, T., Pavlova, T., Yakovleva, O., & Cubo, S. (2017). Glossary of terms for ICT and e-learning: Compare the Polish, Spanish and Russian approach. In E. Smyrnova-Trybulska (Ed.), *Effective development of teachers' skills in the area of ICT*. E-learning series, volume 9 (pp. 105–118). Katowice–Cieszyn: Studio Noa for University of Silesia in Katowice.
  - 15) Smyrnova-Trybulska, E., Morze, N., Yakovleva, O., Issa, Tomayess, Issa, Theodora. (2017). Some methodological aspects of MOOCs developing. In E. Smyrnova-Trybulska (Ed.) *Effective development of teachers' skills in the area of ICT*. Series on E-learning, 9 (2017) (pp.139–158). Katowice–Cieszyn: Studio Noa for University of Silesia in Katowice.
  - 16) Smyrnova-Trybulska, E., Zegzuła, D. (2017). Information Technologies in the Operation of Primary Schools. In E. Smyrnova-Trybulska (Ed.), *Effective development of teachers' skills in the area of ICT*. E-learning series, volume 9 (pp. 331–346). Katowice–Cieszyn: Studio Noa for University of Silesia in Katowice.
  - 17) Smyrnova-Trybulska, E. (2017). Innowacyjne narzędzia w edukacji. *Gazeta uniwersytecka*, 3(253), 20. Retrieved from <http://gazeta.us.edu.pl/node/421323>.
  - 18) Sadovy, O. V. et al. (Eds.). (2017). *Innovations in higher education – 2017*, collection of scholarly papers of Dniprovsk State Technical University (Technical Sciences: section “Education”). Proceedings from international conference *Innovations in Higher Education*. Zбірник наукових праць Дніпровського державного технічного університету. Ser.: , Tehnični nauki. Materiali Mižnarodnoї naukovo-praktičnoї konferencії “Innovaciū višij osviti. Kamianske: DSTU.

- 19) Smyrnova-Trybulska, E., Stec, M., & Sudenska, A. (2017). Glossary for multicultural terms useful for distance education. In O. Sadovy et al. (Eds.), *Innovations in higher education – 2017*, collection of scholarly papers of Dniprovsk State Technical University (Technical Sciences: section “Education”). Proceedings from international conference *Innovations in Higher Education*. Zbìrnìk naukovìh prac' Dnìprovsk'ogo deržavnogo tehničnogounìversitetu. Ser.: , Tehnični nauki. Materiali Mižnarodnoì naukovo-prak-tičnoì konferencii “Ìnnovacii u višij osviti” (pp. 7–13). Kamianske: DSTU.
- 20) Kostolányová, K., Malach, J., Nagyová, I., & Prextová, T. (2017). Creating MOOC in university instruction. In O. Sadovy et al. (Eds.), *Innovations in higher education – 2017*, collection of scholarly papers of Dniprovsk State Technical University (Technical Sciences: section “Education”). Proceedings from international conference *Innovations in Higher Education*. Zbìrnìk naukovìh prac' Dnìprovsk'ogo deržavnogo tehničnogounìversitetu. Ser.: , Tehnični nauki. Materiali Mižnarodnoì naukovo-praktičnoì konferencii “Ìnnovacii u višij osviti” (pp. 13–17). Kamianske: DSTU.
- 21) Liakh, T., Spirina, T., & Popova, A. (2017). Social and pedagogical problems of adaptation of students to distance learning in higher education. In O. Sadovy et al. (Eds.), *Innovations in higher education – 2017*, collection of scholarly papers of Dniprovsk State Technical University (Technical Sciences: section “Education”). Proceedings from international conference *Innovations in Higher Education*. Zbìrnìk naukovìh prac' Dnìprovsk'ogo deržavnogotehničnogounìversitetu. Ser.: , Tehnični nauki. Materiali Mižnarodnoì naukovo-praktičnoì konferencii “Ìnnovacii u višij osviti” (pp. 17–21). Kamianske: DSTU.
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- 23) Nakazny, M., Sorokina, L., & Romanyukha, M. (2017). Development of electronic cards for teaching in the conditions of the higher educational provision of technical profile. In O. Sadovy et al. (Eds.), *Innovations in higher education – 2017*, collection of scholarly papers of Dniprovsk State Technical University (Technical Sciences: section “Education”). Proceedings from international conference *Innovations in Higher Education*. Zbìrnìk naukovìhprac' Dnìprovsk'ogo deržavnogo tehničnogounìversitetu. Ser.: , Tehnični nauki. Materiali Mižnarodnoì naukovo-praktičnoì konferencii “Ìnnovaciiu višij osviti” (pp. 27–32). Kamianske: DSTU.

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- 26) Oujezdský, A., Takács, O., Pastyřík, M., & Glacová, L. (2017). Adaptive study material in Moodle LMS with gamification features. In K. Kostolányová (Ed.), Proceedings from the *Information and Communication Technology in Education (ICTE–2017)*, 4–6 September 2017 (pp. 57–63). Ostrava: University of Ostrava.
- 27) Kuzminska, O., Morze, N., & Smyrnova-Trybulska, E. (2017). Flipped learning: Learning based on students experience. In K. Kostolányová (Ed.), Proceedings from the *Information and Communication Technology in Education (ICTE–2017)*, 4–6 September 2017 (pp. 64–69). Ostrava: University of Ostrava.
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- 29) Nagyová, I. & Stará, N. (2017). Forms of writing algorithms in school tasks. In K. Kostolányová (Ed.), Proceedings from the *Information and Communication Technology in Education (ICTE–2017)*, 4–6 September 2017 (pp. 76–80) Ostrava: University of Ostrava.
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## Summary

The successful completion of the IRNet project provided several major outputs:

- highest quality competence in research in advanced pedagogical science in the area of e-learning, ICT, and intercultural competences with a significant influence on the development of the HEIs staff, and of open information and educational environments from different regions / countries;
- reinforcement of ERA as an internationally-renowned partner of AU and an initiator of cooperation projects in the next Erasmus+, Cost, IVF, H2020

with an international cooperation dimension focused on the participation of companies and development of the close cooperation with outstanding EU and AU partners; and

- synergy of the research offer with the requirements of an innovative education approach and strengthening the cooperation between EU and non-EU HEIs in the framework of an open educational environment and development of SMART universities.

One may state that the knowledge generated by the project and the partnership's important contribution to the area of the European and international research include the following:

- a) a dataset for the analysis of the ICT, e-learning, intercultural competences developing effect in different EU countries was established: the results were published in a series of scientific articles, in particular in prestigious indexed journal *IJCELL*;
- b) a literature and IT tools were reviewed, and their place and their level in European educational systems and in the countries of project partners were analysed; the arrangements of different types of temporary work contracts as implemented in each of the EU countries considered were studied;
- c) a detailed ICT and intercultural competences development methodology for the evaluation of the network research effect in educational institutions of different EU countries was designed;
- d) a deepening of the classification of different welfare state regimes, assessing their effectiveness to represent different educational institutions, was conducted; this result was achieved also by means of a cluster analysis of the systems based on different methodologies and variables;
- e) a detailed identikit of a teacher in EU countries and 3 non-EU project countries as an expression of a given educational regime was described;
- f) country studies aimed at assessing the network research effect in each country were conducted; an important stage of elaboration of these studies consisted of submitting them to international journals; the methodologies were implemented (innovative MA course E-learning in Cultural Diversity, Postgraduate study, training courses, MOOCs, generally more than 210 publications, project journal *IJREL*, ICT-tools, more than 20 didactic videos shared on YouTube, etc.);
- g) a cross-country study of the network research effect was conducted; and
- h) education suggestions on the issues studied in the project were made.

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### **Raport z wdrożenia Pakietu Roboczego Work Package 7: „Rozpowszechnienie wyników projektu” realizowanego w ramach projektu IRNet**

#### Streszczenie

Artykuł ten został przygotowany przez międzynarodowy zespół badaczy reprezentujący różne obszary nauki związane z ICT, e-learningiem, pedagogiką oraz innymi dyscyplinami. Tekst skupia się na celach oraz wybranych wynikach międzynarodowego projektu IRNet ([www.irnet.us.edu.pl](http://www.irnet.us.edu.pl)). Szczególną uwagę skoncentrowano na opisie narzędzi, metod i procedur badawczych wykorzystanych podczas realizacji Pakietu WP7 „Rozpowszechnienie wyników projektu”, to znaczy na celach, zadaniach, rezultatach, publikacjach oraz realizacji wyjazdów naukowych w kontekście kolejnych etapów oraz pakietów projektu IRNet.

**Słowa kluczowe:** Międzynarodowa Sieć Badawcza IRNet, wyniki badań, rozpowszechnienie, e-learning, kompetencje międzykulturowe

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### **Отчет об осуществлении пакета 7: «Распространение результатов проекта», реализованный в рамках проекта IRNet**

#### Анотация

В статье, подготовленной международной группой исследователей из разных научных областей, связанных с ИКТ, электронным обучением, педагогикой и другими смежными дисциплинами, основное внимание уделяется целям и некоторым результатам международного проекта IRNet ([www.irnet.us.edu.pl](http://www.irnet.us.edu.pl)). В частности, в статье описываются инструменты исследования, методы и процедура рабочего пакета 7 «Распространение результатов проекта», а именно: цели, задачи, результаты, публикации и осуществление исследовательских поездок в контексте этапов и рабочих пакетов проекта IRNet - Международной исследовательской сети.

**Ключевые слова:** Международная исследовательская сеть IRNet, результаты исследований, Распространение, ИКТ, электронное обучение, межкультурные компетенции

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### **Informe sobre la implementación del paquete de trabajo 7 «Difusión de los resultados del proyecto» en el marco del proyecto IRNet**

#### **R e s u m e n**

Este artículo, preparado por un equipo internacional de investigadores de diferentes áreas científicas relacionadas con las TIC, el aprendizaje electrónico, la pedagogía y otras disciplinas relacionadas, se centra en los objetivos y algunos resultados del proyecto internacional IRNet ([www.irnet.us.edu.pl](http://www.irnet.us.edu.pl)). En particular, el artículo describe herramientas de investigación, métodos y un procedimiento del Paquete de trabajo 7 “Difusión de los resultados del proyecto”, es decir, objetivos, tareas, entregables, publicaciones e implementación de viajes de investigación en el contexto de las siguientes etapas y paquetes de trabajo del proyecto IRNet – Red Internacional de Investigación.

**Palabras clave:** Red Internacional de Investigación IRNet, resultados de investigación, difusión, TIC, e-learning, competencias interculturales



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