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E-learning for Sustainable Educational Process

Abstract. This paper gives an overview of the skills that are necessary in our century and provides a hypothesis that a dynamic and self-regulated e-learning system can help reach the same learning outcomes as the means of traditional classroom training. The paper emphasises the role of analogical thinking within the context of 21st century learning. It is also argued that effective e-learning comprises of individual learning, learning by collaboration, and learning in a real world environment which motivates learners to use e-learning materials independently, and, at the same time, provides a dynamic and collaborative learning process. Two case studies provide practical examples for proving the viewpoint that e-learning can provide successful learning outcomes if specific factors are taken into account.

Keywords: e-learning, blended learning, collaboration, information and communication technologies, skills

1. Introduction

At the time when rapidly changing information and communication technologies (ICT) influence all spheres of our life, also the need for acquiring new skills and knowledge for professional and everyday life increases. Nowadays individuals find themselves in the situation of constant learning in order to fully participate in the society. Digital skills are necessary competences for the majority of fields and professions. These circumstances along with the information overload

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and constantly growing competition require immediate interdisciplinary knowledge and ability to orient oneself in various branches.

Thus, life-long learning has become a necessity for adults, and the problem emerges about the most appropriate learning forms and methods. The learners need time for acquisition of new knowledge and obtaining new skills, and it creates an additional workload [Karjalainen, Alha & Jutila 2006].

ICT can help organize the learning process in a way that the balance can be found between time for the acquisition of new knowledge and workload. Likewise, by means of e-learning it could be possible to achieve as good results as by traditional academic learning, especially considering the advantages of e-learning – flexibility of changing the content and sustaining it up-to-date, the opportunities of providing demonstrations and simulations, as well as the availability at any time and at any place [Hubbard 2013]. If compared to traditional learning, there is still an ongoing process for establishing the best possible combination of the opportunities provided by the latest technologies with pedagogically grounded methods both for individual and group work so that learners would not lose their motivation and the education could be with long-term contribution.

The purpose of the research is to find out the specific factors that provide successful e-learning outcomes and sustain learners' motivation. The hypothesis of the research is that these factors are constant feedback, support, mutual collaboration and learning activities with group mates, and communication with instructor/trainer using ICT.

2. Learning in 21st century

Nowadays, the technologies change our life by demanding the constant acquirement of new knowledge and skills, as well as by changing the process of learning. As it is indicated in the plan of action “Transforming our World: The 2030 Agenda for Sustainable Development” by United Nations, one of the goals is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. This includes the challenge that by 2030 it is substantially necessary to increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. Another goal of the plan defines the necessity to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. The challenge is to achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors [United Nations 2015].

Within the context of learning, digital economy and sustainable development require people with digital skills, an open mind and critical thinking in order to fully participate in modern society and economy.

“Traditional unidirectional educational processes are only of very limited use when educating for sustainable development: firstly, the initial state of the considered system (case) cannot be described precisely; secondly, the target state of the system is also not sufficiently known; and thirdly, the process between initial state and target state and potential barriers that might have to be passed are also not exactly known. Pure analytically based solutions are therefore, not available; a dynamic mutual learning process is required instead. Mutual learning based on real-world cases requires an interdisciplinary point of view, transdisciplinary problem-solving processes, and self-regulated and self-responsible learning. Consequently, besides analytical capabilities and deterministic process planning, dealing with the complex problem of sustainable development requires creativity, social competencies and specific communication skills in order to cope with the dynamic change that characterizes the developments in most facets of society and nature” [Steiner & Posch 2005].

These skills are also defined in the Framework for 21st Century Learning, determining that the following skills should be ensured by a learning process in 21st century:

“– creativity and innovation,
– critical thinking and problem-solving,
– communication and collaboration” [Framework for 21st Century Learning 2011].

As Philip Johnson-Laird states about the mental models, “the most urgent demands for the twenty-first century are the extension of the theory to problem solving, decision making and strategic thinking when individuals compete or cooperate” [Johnson-Laird 2005: 203].

This situation requires a learning process and methods that are not entirely based on memorizing but largely consist of development of skills, promoting comprehension and discernment.

3. Analogical thinking for 21st century education’s needs

The process of distinguishing and noticing the similarities and analogies can be one of the mechanisms by means of which the 21st century education needs can be reached. This can help acquire the skills for critical thinking, problem-solving and using knowledge and information in new contexts.

Generally, the experience and accumulated knowledge helps people orient themselves in new situations, make decisions and solve the problems. The knowledge is used in the process of thinking through the three types of reasoning – deduction, induction, abduction, by seeking for similarities and differences to deal with similar problem situations [Johnson-Laird 1999]. There are three phases in any training – actualization of previous, apprehension of new, and usage of gained knowledge and skills. The middle phase – is the one that helps learners integrate the new knowledge into their experience. Therefore, it is important to provide the opportunity in this phase to experiment, to express ideas and figure out where the new skills or knowledge can be used [Namsone 2010].

At the 10th International Symposium of Cognition, Logic and Communication “Perspectives on Spatial Cognition”, Professor Dedre Gentner in her keynote lecture at University of Latvia expressed an opinion that the creation of analogies is a powerful learning process where abstract knowledge forms on the basis of experience. In more than 30 years of research she has discovered the principles by which the comparing processes take place in the psyche of children and adults. The scientist considers that structure mapping is based on revealing common relations across systems and common structure, drawing conclusions and revealing the differences between situations. Emphasising that by analogy is meant the structure of common relations or relationships, but not common specific characteristics/features [Gentner 2014]. As stated by L.E. Richland and N. Simms, there is also the model developed for teaching with analogies that is recommended for teachers. This model defines 6 consecutive steps for how to teach with the help of analogies – to “introduce the target concept, review the analog concept, identify relevant features of the target and analogy, map similarities, indicate where the analogy breaks down, and draw conclusions” [Richland & Simms 2015].

Thus, the aim of the learning process is to help learners understand the principles of some phenomenon, action, or situation, and not only perceive the differences in features. This analogical thinking could be facilitated by providing such learning tasks that allow learners to find similarities, decipher differences, and classify according to the found similarities. It could be argued that if a learner has wider experience for finding similarities and classifying, then it is easier to integrate new information in other context by allocation it to a new situation.

4. E-learning as a form of 21st century education

The results of J. Swaak and T. de Jong [2001] research, that are graphically presented in Figure 1, show that the best possible results of learning are achieved if

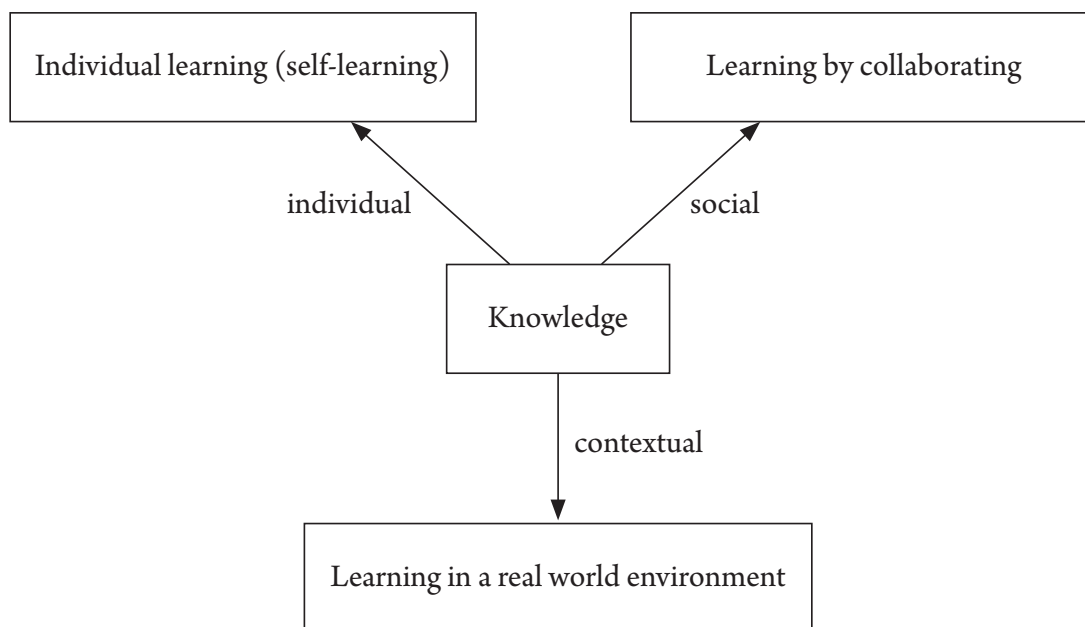


Figure 1. Three ways of getting the knowledge in accordance with the research carried out

Source: Swaak & Jong 2001.

learning involves three types of getting knowledge – individual learning, learning by collaboration, and learning in a real world environment. All these components can be provided by means of e-learning.

E-learning can be a useful medium also for acquiring the 21st century skills in a sense that it is formed on the basis of ICT, it is a digital media using digital tools and requiring digital skills [Hubbard 2013].

“Interaction between learners and teachers needs to be organized in a way that directly generates a demand for learning in the sense of mutually searching for the meaning of the concept of sustainability both for the individual and for the systems in which they are embedded. The following principles for higher education for sustainability, i.e. interdisciplinarity, transdisciplinarity, and self-regulated learning, are a result of these requirements” [Steiner & Posch 2005].

Although e-learning is a self-regulated process based on each learner’s individual pace and needs, it still remains to be a process that requires support. This support in e-learning can be provided by tutor/instructor and by other participants of e-learning [Ghirardini 2011].

As G. Steiner and A. Posch states, by providing the real world cases and communication and collaboration for mutual learning, the process becomes dynamic. For example, “students experience the process of sustainable development instead of purely memorizing its characteristics. The process of educating for sustainable development and practical applied sustainability therefore, becomes sustainable” [Steiner & Posch 2005].

The same principles can be applied when using e-learning as a platform and as a tool. Thus by acquiring new learning tools via e-learning the learning process itself becomes sustainable.

As stated by B. Ghirardini, within the context of availability of ICT tools, e-learning materials gain their usefulness if designed accordingly to the principles that determine their quality:

- learner-oriented content: e-curricula should be adequate and specifically oriented on learners' needs, roles and responsibilities in their professional activities;
- the granularity: e-learning materials must be segmented for more successful acquisition of new knowledge and for the flexibility of planning the time for training;
- captivating content: teaching methods and forms to be used creatively for the learning experience to be exciting and motivating;
- interactivity: frequent learner's involvement/interaction is necessary in order to keep learner's attention and facilitate the acquisition;
- personalization: self-regulating learning materials should be adjustable to student's interests and needs" [Ghirardini 2011: 14].

To achieve a balance in efficient, effective and culturally correct learning, Julie Wedgwood suggests using "a combination of learning strategies and delivery media" [Wedgwood 2013: 91]. J. Wedgwood argues that "blended learning is not about providing a linear route to capability. It is about providing multiple routes, fostering the beginning of learner control over their own learning journey and uses multiple communication technologies embedded in the workflow" [Wedgwood 2013: 95].

Thus in order to ensure an effective e-learning that motivates learners to use e-learning materials independently without trainer's or teacher's participation, and at the same time providing dynamic and collaborative learning process, it is advised to transfer the traditional learning methods to e-learning by means of ICT. Therefore, the following e-learning methodological principles can be proposed for self-regulated learning, for collaboration and communication, and for learning in a real world environment.

For self-regulated learning the classroom lectures can be transferred as synchronous or asynchronous video or audio lectures, as real environmental demonstrations, or as electronic documents, presentations and interactive materials. On-site demonstrations or laboratory works can be organized within the specifically created environment of simulations.

The traditional learning dialogical methods, such as conversations, discussions, "brainstorming", dialogues, and role-games can be transferred to e-learning as asynchronous communication by means of e-mail, forums, blog, audio and video podcasts, and wiki pages. Synchronous communication can be provided

using instant messaging, chat, audio and video conferencing, and online seminars (webinars).

By involving learners in mutual activities, for example, in online discussions or organising group work for solving problems, performing tasks and handing in the results jointly, learners implicitly mutually support and inspire each other. Comments and sharing of ideas in forums can help deeper understand the subject matter and improve the knowledge. Likewise, the mutual collaboration facilitates the learners' engagement in e-learning environment, and that consequently increases the possibility for the learning to be finished, i.e., the learner will not drop out or leave the learning.

Meanwhile, the traditional learning in a real world environment can be transferred as podcasts for the task assignment and receiving the results.

Thus, e-learning implicitly allows to acquire new practical skills and new way of collaboration and communication during the learning process in a real-world situation and in a digital environment.

5. Case studies

The two case studies of online study projects for school teachers proves the theoretical ground that e-learning can provide successful learning and active participation. This involvement can be achieved if e-learning incorporates self-regulated learning, learning by collaboration, and learning in a real-world environment, i.e., if it consists of such components as individual, social and contextual learning.

Moreover, these case studies show a good example how teachers not only learn the usage of ICT tools, but empirically get acquainted with new teaching methods in their own learning process that can be used at schools for teaching their students.

5.1. The project "Trans e-Facilitator"

The international project "Trans e-Facilitator" was carried out in Latvia, Germany, Portugal in year 2014.¹ It was a modular training for facilitators of digital competences ("e-facilitators") and it was based on a set of learning modules that were adapted to specific national needs. These needs had been identified in national surveys analysing e-facilitators' tasks and competence gaps. The target group in Latvia consisted of teachers and librarians. The duration of the learning process was four weeks and it was organised as a blended learning – the first face-to-face

¹ www.trans-efacilitator.eu/content/sections/ [16.11.2015].

introductory seminar, individual learning in Moodle environment for four weeks and a closure face-to-face seminar. During the study process participants individually studied the theoretical material uploaded in Moodle environment, took part in discussion forums, completed and uploaded weekly assignments for grading, as well as took self-evaluation test with 5 questions at the end of each module. It was required also to take the final test that consisted of 20 questions. At the final face-to-face seminar participants shared their experience and gave feedback about the learning process, their progress and assignments.

During the study process the positive activity of participants was observed. All participants finished the online training with the following results: 73% of participants fully completed the training material and handed in all assignments (10% of participants performed 25% of the requirements, 17% of participants – 75%). 90% of participants completed the final test and 73% of participants received the certificate of a successful completion of the e-learning content.

5.2. The project “Online4EDU”

The objectives of the project “Online4EDU”, taking place from January till April, 2016, are to support teachers in applying more digital media in everyday school life, to design and test blended learning concept that facilitates online collaboration tools for school teachers of primary, lower and upper secondary and vocational schools, to extend the use of intergenerational learning and digital competences training, and to prepare teachers for the ECDL Online Collaboration certification test.²

The target group’s training takes place in four European countries: Germany, Estonia, Latvia, and Lithuania.

The training is in a form that blends the first and final face-to-face meetings and individual and group work in Moodle environment. The covering of learning material consists of 3 Modules for reading the theoretical part and carrying out self-assessment tests, completing and handing in individual and group tasks and final project presentation. Tasks are evaluated by trainers of the project. Participants are expected to participate actively in forum, participate in monthly webinars and complete the necessary tasks. The learning process is supervised by the project’s trainers by giving feedback, communicating with participants and supporting them. If the previously mentioned tasks are completed, the participants (teachers) will be allowed to take the ECDL test which is mandatory. In case of a positive result, the ECDL certificate will be issued to the teacher.

² www.online4edu.eu/ [16.11.2015].

Although the project's requirement is that at least 30 teachers from Latvia are involved in the training process, there are 34 teachers participating from Latvia, who already actively participate in the online training.

At the end of the Module 1, almost 90% of participants joined the online meeting. None of the participants has dropped out or left the e-learning in Module 1. All participants actively complete and hand in (upload in Moodle environment) the tasks and cooperate in group works.

The key factors for successful outcomes of the projects and for motivation of participants were a constant feedback, support, mutual collaboration with group mates and communication with instructor/trainer.

6. Conclusion

All the methods and principles in this paper are given from the pedagogical point of view, however, in order to choose the most appropriate methods and tools also the technological aspect should be taken into account as well as digital skills of learners. The e-learning can help fill the gap of dynamic at the same time self-regulated learning that the unidirectional education lacks within the context of nowadays needs for sustainable education. E-learning helps balance time for the acquisition of new knowledge and workload.

As case studies show, by means of professionally and pedagogically grounded e-learning it is possible to reach the learning objectives if it incorporates self-regulated learning, learning by collaboration, and learning in a real-world environment. Also, the experience gained during the learning can be transferred and used in real life situations if analogical thinking, identification of similarities and critical thinking is applied and forms a basis for problem-solving and creativity.

The hypothesis of the research by means of both case studies is proven that providing such specific elements as constant feedback, support, mutual collaboration and learning activities with group mates, and communication with instructor/trainer using ICT, the successful e-learning outcomes and sustain learners' motivation can be reached.

References

- Framework for 21st Century Learning. Partnership for 21st Century Skills, 03/2011, www.p21.org/about-us/p21-framework [16.11.2015].
- Gentner D., 2014, Keynote lecture "Comparison and relational language in the development of relational categories" in 10th International Symposium of Cognition, Logic and Communication "Perspectives on Spatial Cognition," University of Latvia, www.lu.lv/zinas/t/29126/, <http://cognition.lu.lv/symp/10-call.html> [16.11.2015].

- Ghirardini B. (ed.), 2011, A guide for designing and developing e-learning courses, *E-learning methodologies*, FAO.
- Hubbard R. (ed.), 2013, *The Really Useful eLearning Instruction Manual*, London: Wiley & Sons.
- Johnson-Laird P.N., 1999, Deductive Reasoning, *Annual Review of Psychology*, 50: 109-135, www.cogsci.ucsd.edu/~coulson/203/johnson-laird.pdf [16.11.2015].
- Johnson-Laird P.N., 2005, Mental models and thought, in: *The Cambridge Handbook of thinking and Reasoning*, eds. K.J. Holyoak, R.G. Morrison, Cambridge: Cambridge University Press.
- Karjalainen A., Alha K., Jutila S., 2006, *Give Me Time to Think. Determining Student Workload in Higher Education*, Oulu: Oulu University Press.
- Namsone D., 2010, Dabaszinātnes skolā – atbilstoši laikam: dabaszinātņu didaktika skolā, Lielvārde: Lielvārds, in: R. Birziņa, *Bioloģijas mācību stunda. 1.1. Mācību stundas plānošana*, Latvijas Universitāte, <http://profizgl.lu.lv/mod/book/view.php?id=20423&chapterid=5159> [16.11.2015].
- Richland L.E., Simms N., 2015, Analogy, higher order thinking, and education, *Wires Cogn Sci*, doi: 10.1002/wcs.1336, http://learninglab.uchicago.edu/Publications_files/Richland_Simms_2015%20%282%29.pdf [16.11.2015].
- Steiner G., Posch A., 2005, Higher education for sustainability by means of transdisciplinary case studies: an innovative approach for solving complex, real-world problems, *Journal of Cleaner Production*, 14: 877-890, www.sciencedirect.com [16.11.2015].
- Swaak J., Jong T. de, 2001, Discovery simulations and the assessment of intuitive knowledge, *Journal of Computer Assisted Learning*, 17: 284-294.
- United Nations, 2015, *Transforming our World: The 2030 Agenda for Sustainable Development*, <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication> [16.11.2015].
- Wedgwood J., 2013, Blended Learning, in: *The Really Useful eLearning Instruction Manual*, ed. R. Hubbard, London: Wiley & Sons.

E-learning na rzecz zrównoważonego procesu dydaktycznego

Streszczenie. Artykuł omawia umiejętności, których wymaga życie w XXI wieku oraz zakłada, że dynamiczny i samoregulowany e-learning pozwala na osiągnięcie podobnych wyników nauczania jak tradycyjna nauka w sali zajęciowej. Podkreśla również rolę analogicznego myślenia w kontekście uczenia się w XXI wieku. Wskazuje ponadto, że skuteczny e-learning, który łączy naukę indywidualną z nauką poprzez współpracę i naukę w środowisku rzeczywistym, motywuje uczącego się do samodzielnego korzystania z materiałów dostępnych online, a przy tym zapewnia odpowiednią dynamikę i poziom współpracy w ramach procesu. Za pomocą dwóch studiów przypadków ilustruje, jak odbywa się to w praktyce, dowodząc, że e-learning może przynosić zadowalające efekty, jeżeli tylko wzięte zostaną pod uwagę określone czynniki.

Słowa kluczowe: e-learning, blended learning, współpraca, technologie informacyjne i komunikacyjne, umiejętności