Smart learning and learning environments[*]

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1. Introduction

Improving of new technologies have made acquiring knowledge more effective, more flexible and convenient for students. The aim of smart schools is developing the educational system in order to forward knowledge and skills necessary in the 21st century as well as keeping up with the challenges and need of modern society. Smart education has received an emphasized attention on a global level. The first smart education projects appeared in Malaysia in 1999. The purpose of Malaysian smart schools is to advance the country's labor for the 21st century by providing the schools with the most advanced technologies. Smart schools do not only focus on innervating the students thinking and creativity, but take individual needs as well as learning methods in account. Australia in cooperation with IBM created a student centered, disciplines comprehensive education system which connects the schools, higher education institutes and labour education. The primary aim of the South Korean smart education project on the one hand was to remodel the education system, on the other hand to develop educational infrastructure. The smart education programs developed in New York emphasize the integrated role of technologies in the classrooms and their priority aim is to increase the students' performance as well as advancing skills needed in the 21st century. Technology has a very important function in smart schools in both the teaching-learning process and in school management. On the one hand it is the means of processing information; on the other hand it serves for professional development and computerized teaching. It can be stated that the direction of the areas of global education is founded in smart learning and its development.

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2. From e-learning to smart learning

Information technology and the learning environment have gone through significant development in the past few decades. As a result of digitalization network communication subfields were formed. Studying the development of technology directed learning it can be determined that the starting point is electronic learning (e-learning) which means that teaching-learning methods are available through computer networks.[1]

With the development of mobile and cordless technologies mobile learning (m-learning) has been in the foreground. It emphasizes the use of mobile devices and focuses on the learners mobility counter to traditional educational methods.[2] M-learning – as it is accepted by its definition – refers to all learning methods based on technology that apply when students are not at a certain location and take advantage of the possibilities of mobile technology.[3]

As a new learning paradigm appeared the so called u-learning (ubiquitous learning). Developing computer and cordless communication technologies contributed greatly to the spreading of u-learning. In the past few years there have been several computer and communication technologies under development, to name a few the RFID tags and cards, cordless communication devices, mobile phones, PDA-s and portable computers. In u-learning mobile, cordless and sensor technologies are used.[4]

The new era conception of global education is smart learning and its aim is to provide contextual, individualized and smooth learning. There has not been a uniformly accepted definition for smart learning so far. According to some perspectives smart learning is no other than context conscious learning that is available everywhere.[5] According to another approach, although smart learning is based on developed IT infrastructure, its emphases is not on the use of smart devices but more on focusing[6] on the students and the content. According to other opinions, smart learning is student centric, service oriented educational paradigm.[7]

Smart learning relies on smart devices and technologies, such as the cloud based computer technology, the study analyzing, the big data, the IoT and the portable technologies. The cloud base computer technology, the study analyses

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[1] About e-learning in details see: Kovács Ilma: *Az elektronikus tanulásról a 21. század első éveiben.* Magánkiadás, Budapest, 2011. http://mek.oszk.hu/09100/09190/09190.pdf, 2019. szeptember 9.

[2] Zhi-Ting, Zhu – Ming-Hua, Yu – Peter, Riezebos: A research framework of smart education. *Smart Learning Environments*, 2016/1, p. 2.

[3] About m-learning in details,see: Benedek András: Mobiltanulás és az egész életen át megszerezhető tudás*. Világosság*, 9. (2007), pp. 21–28.

[4] Saadiah Yahya – Erny Arniza Ahmad – Kamarularifin Abd Jalil: The definition and characteristics of ubiquitous learning: A discussion. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 1 (2010), pp. 117–127.

[5] Gwo-Jen Hwang: Definition, framework and research issues of smart learning environments - a context-aware ubiquitous learning perspective*. Smart Learning Environments*, 4 *(*2014), pp. 4–6.

[6] Ibid. pp. 4–6.

[7] Taisiya Kim – Ji Cho – Bong Lee: *Evolution to Smart Learning in Public Education: A Case Study of Korean Public Education.* Open and Social Technologies for Networked Learning, ed. by L. Tobias, R. Mikko, L. Mart, T. Arthur, Berlin Heidelberg, Springer, 2013, pp. 170-178.

and the big data focus on how to record learning data, how they can be analyzed, how much learning and teaching can be developed and how they can contribute to the development of individualized and adaptive learning. In addition, IoT and portable technologies can also contribute to the development of contextual learning.[8] To support and develop learning smart hardware and software can both be used. Hardware, such as interactive blackboard, smart table, e-bag, mobile phones, portable devices, etc. as well as software like computer teaching games, virtual reality, learning analysis serve these purposes.[9] Information and communication technologies – besides traditional teaching exercises – support several virtual programs as well as help groups with special needs in learning and developing skills.

3. The structure of smart learning

In the literature there is no unified definition for smart learning, however, it could be generally determined that it has three basic components: smart environment, smart learning techniques and smart learners. Smart learning techniques greatly influence smart environment which both contribute to the development of smart learners.[10]

3.1. Smart learners. Learning is the process of acquiring and comprehending knowledge. The 21st century demands skills and professional knowledge in order for people to efficiently spend work and spare time and to be prepared for this is the task of the education.

In smart education there are four levels of the skills that learners should obtain in order to befit the needs of modern society. These skills are the following: basic and primary skills, comprehensive qualities, individualized skills and collective intelligence.[11]

Basic and primary skills refer to knowledge and skills acquired by the so called basic subjects such as writing, reading, art, STEM, etc. which are essential in order to succeed. Comprehensive skills include critical thinking, ability to solve real problems which make learners capable of arguing and thinking comprehensively in complex situations.[12]

Individualized skills require information and technological knowledge and obtaining creativity and innovative skills thoroughly. Information and technological knowledge demand acquiring ICT-skills from the students which skills include the use of the different ICT applications and the ability of their combinations with the cognitive or higher level of thinking. Creative and innovative skills demand creative thinking and cooperation with others.[13]

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[8] Zhi-Ting, Zhu – Ming-Hua, Yu – Peter, Riezebos: op. cit. pp.. 2–3.
[9] Ibid. pp. 5–6.
[10] Zhi-Ting, Zhu – Ming-Hua, Yu – Peter, Riezebos: op. cit. p. 6.
[11] Ibid. p. 7.
[12] Ibid.
[13] Ibid.

Collective intelligence refers to a knowledge that is created by a group of people's communication and cooperation. Learners must be able to communicate efficiently and communication demands that they work efficiently and respectfully in the different work groups.[14]

3.2. Smart learning techniques. To improve students' performance the following teaching techniques can be outlined: differentiated teaching in the classroom, group work based on cooperation, individual studying and generative mass based learning.[15]

Differentiated education is a process in which the students of different skills study in the same group, but teaching and learning are individualized.[16]

In group studying based on cooperation the students study in groups, they plan they divide the tasks together and each student is responsible for the success of the task. The teacher is only to supervise and help if needed.[17] Owing to the development of computers as well as information and communication technologies (ICT) there is a new paradigm of education technology: cooperative learning supported by computers (CSCL).[18] The CSCL focuses on how ICT contributes to cooperative learning.[19]

In case of the individualized learning the learning process and tasks need to be student specific. As opposed to external motivation the students' individual interest is more important as they are driven by their passion. In this process the students achieve by their own inner motivation and therefore discover their interest.[20]

When the students learn online they are capable of connecting old and new information, acquire basic knowledge and use metacognitive skills and online learning also results in ceasing of time and space boundaries.[21]

3.3. Smart learning environments. One criticism placed upon traditional learning techniques is that it is too artificial, stiff and is not receptive to present social requirements. In the digital era it has become an everyday phenomenon to use technology in teaching and learning. Children today can be called digital indigenous who are able to use mobile devices, digital sources on an every day basis therefore learning environment has changed as well.

There is no accepted definition of smart learning environment (SLE). According to Jonathan Michael Spector the primary feature of the smart learning environment is the use of innovative technologies that provide more flexibility, efficiency,

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[14] Ibid.

[15] Jonathan Michael, Spector: Conceptualizing the emerging field of smart learning environments. *Smart Learning Environments* 2 (2014), p. 2.

[16] Ld.: M. Nádasi Mária: *Adaptív nevelés és oktatás.* Magyar Tehetségsegítő Szervezetek Szövetsége, 2010. pp. 14–20.

[17] See: Horváthné Zilahy Ágnes: Hatékony tanulás. *Új Pedagógiai Szeme*, 12 (2004), pp. 98–99.

[18] Timothy, Koschmann: Paradigm shifts and instructional technology: An introduction. *In:* Koschmann, Timothy (szerk.)*: CSCL, Theory and Practice of an Emerging Paradigm: Theory and Practice of an Emerging Paradigm. Lawrence Erlbaum Associates*, 1996, pp. 1–23.

[19] Molnár Pál: Számítógéppel támogatott együttműködő tanulás online közösségi hálózatos környezetben. *Magyar Pedagógia*, 3 (2009), p. 261.

[20] Zhi-Ting, Zhu – Ming-Hua, Yu – Peter, Riezebos: op. cit. p. 10.

[21] Ibid.

adaptability, motivation and feedback for the students.[22]

According to Zhi-Thing Zhu, Ming Hua Yu and Peter Riezebos the purpose of smart education is to provide lifelong learning which in a smart environment focuses on advancing the students intelligence and problem solving skills by providing contextual, individualized and adaptive learning.[23]

According to Ronghuai Huang, Junfeng Yang and Lanquin Zheng smart environment is a kind of space for learning or activities which recognizes learning scenarios, identifies the students' characters, provides proper learning sources and interactive devices as well as for the efficiency of learning it automatically records the learning process and evaluates the results. The SLE is a high level of the digital learning environment which is the result of the development of educational technology.[24]

The authors above all agree that there are certain special features, criteria and components which result in creating a smart learning environment.

In Ronghuai Huang, Junfeng Yang and Lanqin Zheng's opinion the smart learning environment keeps track of the students' status therefore can provide more precise help for learning, recognizes learning scenarios, sets the air, temperature, light- and sound conditions as well as connects the students with student groups in order to broaden learning experience.[25]

According to Jonathan Michael Spector, SLE bears the following features:

a) the ability to acquire , broaden and modify knowledge,
b) it provides the students with devices, knowledge and skills for solving tasks,
c) utilizes student information,
d) recognizes specific conditions in which the students need help,
e) develops the students' self evaluating skills, suggests further tasks for improve efficiency,
f) use of new innovative technologies,
g) ability to motivate and maintain the students' interest,
h) adapts to changes, for example in case of a new student joining the course or further tasks are assigned,
i) adaptive, in other words it adapts to the students' special needs, recognizes student's competence, interest and learning techniques,
j) provides students with individualized tasks and feedback.[26]

According to Zhi Ting, Zhu, Ming Hua, Yu and Peter Riezebos the features of SLE among many others are localization, context-consciousness, providing continuous contact, furthermore, it senses social contacts and provides platforms for the exchange of ideas and knowledge. In their perspective the purpose of smart learning environment is to provide fast, self teaching, self motivating,

[22] Jonathan Michael, Spector: op. cit. p. 2.
[23] Zhi-Ting, Zhu – Ming-Hua, Yu – Peter, Riezebos: op. cit. p. 10.
[24] Ronghuai Huang – Junfeng Yang – Lanqin Zheng: The Components and Functions of Smart Learning Environments for Easy, Engaged and Effective Learning. *International Journal for Educational Media and Technology* 1 (2013), pp. 8–9.
[25] Ibid.
[26] Jonathan Michael, Spector: op. cit. pp. 7–8.

individualized and smooth learning which decreases the students' cognitive burdening[27]

In the smart learning environment we can learn anywhere, at any time, in any place. Therefore schools of the 21st century need to create a learning environment that provides the necessary learning directives for the students as well as information, suggestions and means.[28] Smart learning environment must integrate formal and informal learning in order to create an autonym, adaptive learning environment to support the students. Smart school process changes student teaching techniques: student's diversity is considered rather an advantage or strength than an obstacle in teaching. Students' skills, needs and learning style is closely observed so the teachers can plan accordingly and more effectively. Teaching then will be suited for each student. Ensuring access and use to digital technology in education could decrease the gap for learning among the students with different social-economical background.

One of the main elements of the education is digital literacy which has become an essential requirement recently. For life-long learning it is necessary to have digital literacy, qualities to use information and communication technology, ability to acquire knowledge, relearning, self learning as well as working together with others.[29] The key competence necessary for life-long learning is digital competence, which means the use of digital technologies with conscious and critical thinking and covers all the knowledge and skills that one needs in the digital society.

4. Final thoughts

The birth and development of the new computer, communication and sensor technologies opened up great opportunities to create new learning environments. Creating a smart learning environment needs the cooperation of educators, computer and information specialists as well as teaching professionals as they all contribute to developing learning and learning functions, furthermore they provide learning contents and goals. Digital learning is essential in every level of education for which the presence of innovation is necessary on the level of technology, pedagogy and organization. The school of the future is digital where every student and teacher is on the digital network through either private or school digital devices. The method of teaching and the teaching materials are digital and taught by digitally prepared teachers; furthermore administration and the training of teachers are also digital.

The purpose of smart learning is to provide the people with individualized services and smooth learning experiences. Smart learning therefore is a new concept that creates a more effective and useful learning environment than the

[27] Zhi-Ting, Zhu – Ming-Hua, Yu – Peter, Riezebos: op. cit.. pp. 11–12.

[28] Abtar Darsham, Singh – Moustafa, Hassan: *In Pursuit of Smart Learning Environments for the 21st Century*. 9. http://unesdoc.unesco.org/images/0025/002523/252335E.pdf, 2019. szeptember 9.

[29] Gál Franciska: Milyen lesz a jövő iskolája?, *Tanító*, 7 (2012), p. 7.

already existing technology based teaching techniques, however, there will be several challenges in the future in respect of learning techniques, teaching systems and ideologies.

The best investment in the future is education and training, which plays a key role in advancing in growing, innovation and creating new jobs. Information and communication technology is more and more important in every walk of life, therefore it must be available for everyone to learn ICT skills. Owing to the information and communication technologies new, innovative learning possibilities are formed which make it possible for students to take complex tasks, receive evaluation and share resources. Education in the future must comply with the requirements of the digital age and ensure knowledge, skills and competences necessary for the people for innovation.