Learning in hybrid spaces as technology-enhanced outdoor learning: Key terms

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Abstract - *One of the ideas for improving urban green spaces is adding to them a virtual dimension, or, in other words, equipping them with some kind of technological infrastructure. Such spaces, combining nature with technology, are named in many terms, e.g. outdoor cyber-mediated spaces, technologically enhanced urban green spaces, blended digital/urban green spaces or – which is the most precise – hybrid spaces. A hybrid space is quite an innovative solution, because traditionally the natural environment and digital domains are seen as distinctly different. In addition, researchers agree that hybrid spaces offer an attractive learning context, although little is known about learning in hybrid spaces. This chapter defines learning in hybrid spaces as technology-enhanced outdoor learning, and discusses such contextual key terms as technology-enhanced learning, and outdoor learning, as well as the technological requirements for technology-enhanced outdoor learning, selected technologies of technology-enhanced outdoor learning, namely personal digital assistants, e-libraries, quick response codes, Kinect-laptop-integrated system, geographic positioning system, digital textbooks, cloud computing. Finally, it offers design guidelines for technology-enhanced outdoor learning. This can be useful for anyone interested in the educational use of hybrid spaces.*

Keywords - Technology-enhanced learning, outdoor learning, Internet of things, digital textbooks, cloud computing, n-screen

INTRODUCTION

The central places in the contemporary global urban planning is occupied by the question about what should be done to provide cities with "good" urban green spaces (Lindholst et al., 2016). One possible answer is: urban planners have to add to green spaces a virtual dimension (Thomas, 2014). In other words, they have to equip urban green spaces with some kind of technological infrastructure (Menezes & Smaniotto Costa, 2017). Such new type of urban green spaces (combining two contradictory realities of nature and technology, Patricio, 2017) are named in many terms, e.g. outdoor cyber-mediated spaces, technologically enhanced urban green spaces (Duarte et al., 2015), blended digital/urban green spaces (Smaniotto Costa, Menezes & Šuklje-Erjavec, 2015). Nevertheless, the most popular term is hybrid spaces (Menezes & Smaniotto Costa, 2017).

An example of hybrid space can be a park (or green squares, gardens, greenways, green belts, community and allotment gardens, waterfronts, urban woodlands and urban wilderness etc., Smaniotto Costa & Šuklje-Erjavec, 2015) with Wi-Fi. Here it is possible to move around using a dedicated application and where various types of interactive devices are located (Smaniotto Costa, Menezes & Šuklje-Erjavec, 2015). What is interesting, the hybrid space forms an attractive learning context. It is because

> *"digital learning technologies can be used to complement and extend real-world outdoor learning – in taking and sharing of photos, videos and audio recordings, using art and design software and Internet searches, creating blogs, and so on" (Pierre, 2013, p. 155).*

Moreover, the ways of learning of the Net Generation (or other digitally inclined learners)

> *"can be addressed in the ways in which we think about the natural world as a learning resource. In this vein [...] nature might be understood as a giant, multisensory, multimedia, living museum, real-world Wikipedia, dispersed wilds akin to the Internet, or outdoor web of nature" (Pierre, 2013, p. 155).*

What is more, as further explained by this author, this type of immersion in the natural environment helps peoplerecover from the effect of digital technologies.

> *"Outdoor learning involving touch, taste, smell, sound, and sight might make creative use of digital technology [...] a healthy balance [. . .] may develop between learning in the digital and natural worlds. [...] nature can be seen as a giant living library or museum filled with an infinite variety of interesting, touchable, see-able, feel-able, smell-able, and hear-able knowledge, facts" (Pierre, 2013, p. 155).*

Moreover, hybrid spaces open learning to the disabled, for example blind or visually impaired (Benton, 2011). What is surpassing, little is known about learning in hybrid spaces (Klichowski, 2017). Thus, in this paper selected key terms for hybrid spaces are discussed. As Fig. 1 shows, because, from the perspective of learning theories, learning in hybrid spaces assumes the form of technology-enhanced outdoor learning (Veletsianos et al., 2015; Klichowski, 2017), the most crucial terms are: technology-enhanced learning and outdoor learning. Thus, the first two paragraphs are dedicated to these terms. Further paragraphs refer to other less fundamental terms. These are: technological requirements for technology-enhanced outdoor learning, selected technologies of technology-enhanced outdoor learning such as: personal digital assistant, e-library, quick response codes, Kinect-laptop-integrated system, geographic positioning system, digital textbooks, cloud computing; and finally design guidelines for technology-enhanced outdoor learning (for more, see Klichowski, 2017).

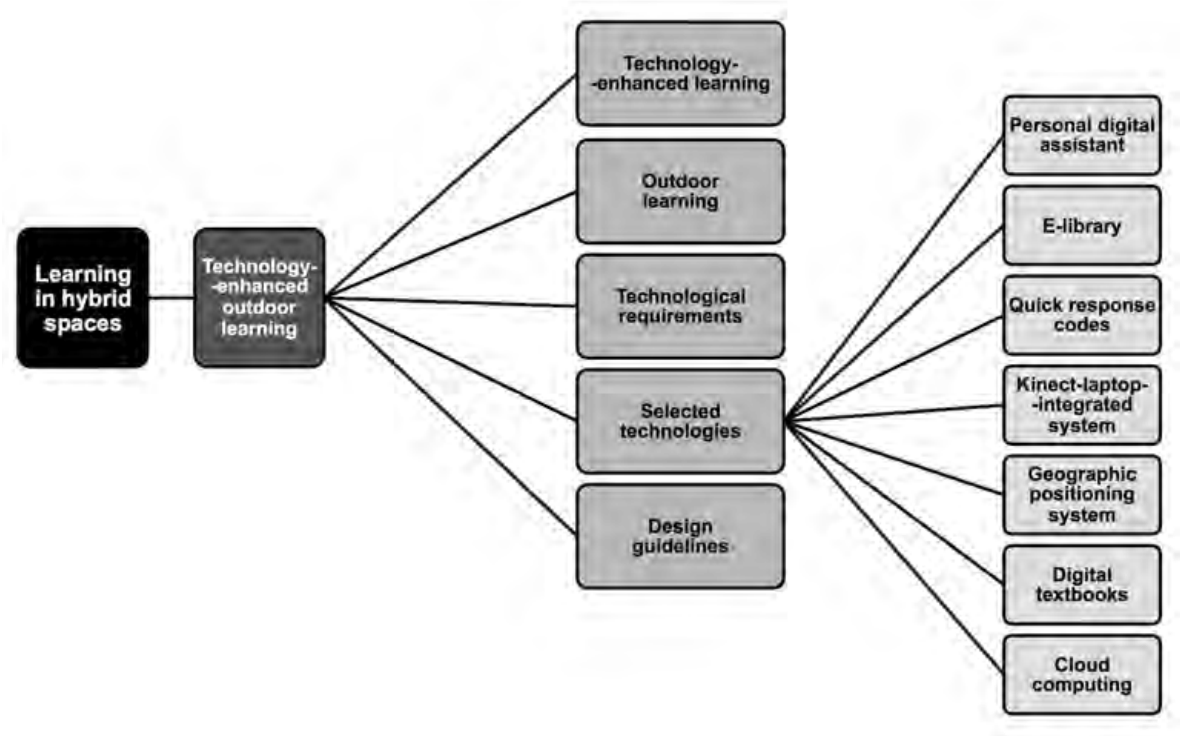

Fig. 1: Key-terms for learning in hybrid spaces. From the perspective of learning theories, learning in hybrid spaces assumes the form of technology-enhanced outdoor learning.

TECHNOLOGY-ENHANCED LEARNING

Technology-enhanced learning (sometimes described in literature as computer-based learning, technology-mediated learning, online learning or web-based learning, Yusuf & Al-Banawi, 2013) is not just a strategy for introducing technologies into learning, but it is a certain new approach to the whole process of learning (Arh, Blazic & Dimovski, 2012). This is because technology-enhanced learning means not only the process of learning with the use of technologies, but the process of learning that is strengthened, improved, enriched and enhanced by technologies (Foshee, Elliott & Atkinson, 2016; Arh, Blazic & Dimovski, 2012); technology-enhanced learning must refer to "*situations in which technology is used to enhance the learners' experiences*" (Kehrwald & McCallum, 2015, p. 43).

Nevertheless, there are no clearly categorized technological solutions characteristics of technology-enhanced learning. In this process it is possible to use all new technologies such as tools that allow to work with electronic texts, illustrations or photographs, as well as everything that gives access to sounds, voices, and animations and videos recorded (Ng'ambi et al., 2016). Thus, these can simply be technological solutions of any type, from electronic toys, to computer games, applications, tablets and smartphones, to advanced software and very complicated machines (Portaet al., 2012).

What is also important, technology-enhanced learning is a theory of learning of the student-centric oriented type (Chai, Wong & King, 2016). This approach is radically different from traditional learning known from a typical school where the teacher is in the centre (Yusuf & Al-Banawi, 2013).

> *Here, "teachers act as a facilitator […] rather than a sole expert of knowledge […] technological tools enable students to become an active participant […]. For instance, instead of sitting in front of a desktop computer […] students with mobile devices can go out to the field, directly and physically explore our world, and share their experiences with others" (Looi et al., 2010, p. 156).*

OUTDOOR LEARNING

The essence of outdoor learning is a real, true context of learning (Thorburn & Allison, 2013). Mostly generally speaking, outdoor learning "*is regarded as pedagogy – a means to deliver the curriculum from across many disciplines in authentic contexts*" (Christie, Beames & Higgins, 2016, p. 418). In this process it is simply about going beyond school classroom or one's own house and learning through observation and participation in real life (Cengelci, 2013). And because is assumed here that "*the physical and cultural natural environments offer the learning framework*" (Moldovan & Enoiu, 2014, p. 28), outdoor learning does not have to take place exclusively close to nature (Janiuk, 2013), but it takes place both in the natural and artificial (man-made) environments (Smeds, Jeronen & Kurppa, 2011).

Nevertheless, it is the vicinity to nature (as in school grounds, parks, protected areas etc., Black, 2013) that forms a special value of outdoor learning in the contemporary world (Waite, 2013; O'Reilly, 2014). Such (nature-based) version of outdoor learning matches the idea of holistic learning (Thorburn & Allison, 2010) and is "designed to support the new holistic curriculum intentions in a variety of ways, e.g. through making greater connections with literacy, numeracy, and health and wellbeing" (Thorburn & Allison, 2013, p. 423). Moreover, it expresses an idea that in order to better understand both the everyday life and abstract concepts, it is necessary to leave the building of a school, which is out of touch with the reality. When for example pupils learn about a place of great natural interest, they should take their maps and compasses, find this place and visit it, and when they learn about a plant, they should take a measure or a magnifying glass and study this plant thoroughly (Cengelci, 2013). In this context outdoor learning meets mobile technologies (and so technology-enhanced learning, Klichowski, 2017) such as smartphones or tablets. These are currently becoming the most multitasking tools that allow studying the world (Cengelci, 2013). Their mobility makes it possible to use them in outdoor learning (which is now starting to be technology-enhanced outdoor learning), both as tools for getting to know a given place, and carriers of information that allow to learn various types of topics while sitting outside (Waite, 2013; for more, see Klichowski, 2017).

TECHNOLOGICAL REQUIREMENTS FOR TECHNOLOGY-ENHANCED OUTDOOR LEARNING

Although technology-enhanced outdoor learning is a new and still barely known educational paradigm, it has clearly defined technological requirements. As a minimum, it requires a 4G and Wi-Fi infrastructure (Lee, Zo & Lee, 2014) and some kind of a smart device (Ha & Kim, 2014). Nevertheless, technology-enhanced outdoor learning is in continuous development and new versions are being created (Yusuf & Al-Banawi, 2013). Philosophers dealing with education and technology notice that in the future will be possible to implement learning strategies in education that would be based on even more advanced technological solutions, such as gesture-based computing (Sandars, 2013). Such a vision, though, still has a structure of a transhumanistic vision (linked to cyborgization, Klichowski, 2015B), thus it is difficult to evaluate the power of its predictions and real educational sense (Klichowski, 2015A; Klichowski, 2015C).

The option to perceive technology-enhanced outdoor learning from the perspective of the cybermatics concept – a broader vision of the Internet of Things (IoT), sometimes called hyper IoT (Ning et al., 2016), seems to be much closer to reality.

> *IoT "becomes an attractive system paradigm to realize universal interactions among the ubiquitous things through heterogeneous spaces. The future IoT is expected to be characterized by the comprehensive perception, reliable transmission, and intelligent processing to achieve pervasive interconnections, intelligence, and efficiency" (Ning et al., 2016, p. 504).*

Cybermatics, as a proposed hyper IoT, is supposed to be based on combining the elementary spaces of human development, such as cyberspace, physical space, social space and thinking space, through a network of objects. As a result, a cyber-physical-social-thinking hyperspace (CPST hyperspace) is to be created (Ning et al., 2016). Technology-enhanced outdoor learning perceived from the perspective of cybermatics would then mean learning through the CPST hyperspace.

SELECTED TECHNOLOGIES OF TECHNOLOGY-ENHANCED OUTDOOR LEARNING

Personal digital assistant and e-library

Hung, Lin and Hwang (2010) describe the use of the personal digital assistant (PDA) and e-library by children to observe nature. In this example of technology-enhanced outdoor learning, after a preliminary diagnosis of pupils' knowledge, the process of observing selected natural objects begins, accompanied by taking notes (in the form of a text, film, photo, sound etc.) on them via the personal digital assistant. Then, once the observation is over, pupils compare their notes with information in the e-library.

Quick Response codes

Perez-Sanagustin et al. (2016), as well as Lai, Chang, Li, Fan and Wu (2013), indicate that Quick Response codes (QR codes, Hau, Siraj & Alias, 2013) can be an interesting technological solution for technology-enhanced outdoor learning. Equipped with smartphones or tablets, pupils walk around a garden and scan Quick Response codes placed all over on different objects (for example, on trees, bushes or monuments), thus receiving to their ICT tools some contextual information that they can then transform and enhance (for example, by adding a multimedia note).

Kinect-laptop-integrated system

Yet another technological strategy is presented by Pan, Tu and Chien (2014). In their example, a Kinect-laptop-integrated system are places in some interesting spots in a park. The Kinect system recognizes pupils' movements and based on that it activates short educational films about a certain place of interest on the laptop (the system uses the so-called Kinect-Activating Film-Playing Device).

Geographic positioning system

As underlined by Perez-Sanagustin et al. (2015; 2016), geographic positioning system (GPS) continues to be the most frequently and efficiently used location-tracking technology for technology-enhanced outdoor learning. Applications (run on a smartphone or tablet) that use geographic positioning system to determine where the student is are utilised here, so that they receive information suitable for the place they are currently at (for example, if they are in a park close to an interesting tree species, their smartphone runs an animation that shows its structure) (Mannheimer Zydney & Warner, 2016). Furthermore, Schwartz (2016) points to the fact that the geographic positioning system can also be used to learn local history and geography in the park; the teacher can select suitable waypoints, and pupils visit and explore them, directed by the geographic positioning system (for more, see Klichowski, 2017).

Digital textbooks

A digital textbook is nothing else, but a school textbook based on new technologies (Klichowski et al., 2015). Its content is presented in an attractive, multimedia way; what is more, it is interactive, i.e. it makes possible to add notes or links to the content studied, etc. The digital textbook can be used on any mobile device like a smartphone, tablet or laptop, so pupils can use it also outdoor (Kim et al., 2013; Jang, 2014).

Cloud computing

Cloud computing makes it possible to transfer educational materials, in any format, from personal devices to a cloud that can be accessed by all participants of the process of education, anywhere and anytime, without the need to download these materials to the device that they are currently using. The cloud thus makes it possible to learn everywhere (so also outdoor), by using any device with access to the Internet (Jeong, Kim & Yoo, 2013; Jang, 2014; Gonzalez-Martinez et al., 2015).

DESIGN GUIDELINES FOR TECHNOLOGY-ENHANCED OUTDOOR LEARNING

In order to maximize the effectiveness of technology-enhanced outdoor learning, it is necessary to take elements of the idea of place-based education into account while designing it. This assumption creates so-called three design guidelines for technology--enhanced outdoor learning. These are: (1) "Facilitate participation in disciplinary conversations and practices within personally relevant places"; (2) "Amplify observations to see the disciplinary-relevant aspects of a place"; (3) "Connect local experiences to those of general, disciplinary concerns through exploring new perspectives, representations, conversations, or knowledge artefacts" (Zimmerman & Land, 2014, p. 78).

CONCLUSIONS

In summary, it is thus possible to state that the strategy for the completion of learning in hybrid spaces (understanding as a technology-enhanced outdoor learning) is constituted with the n-screen, concept, i.e. it refers to the vision of learning through any types of screens (for example smartphones, tablets, laptops, computers, TV sets) connected to an educational cloud that is full of educational resources, and serving as a platform for educational communication (Kim & Oh, 2014). However, learning in hybrid spaces leads students equipped with mobile screens (mobile technologies), connected to the school cloud, out of educational institutions and learning close to nature (Klichowski & Smaniotto Costa, 2015; Klichowski et al., 2015). Thus, learning in hybrid spaces seems to represent some balanced (healthy) approach to the level of technologies use in learning: in hybrid spaces people are supposed to use technologies, but they are also supposed to be close to nature, i.e. a reality that has not been technologised (for more, see Klichowski, 2017). And this is the key not only to balanced learning, but also to balanced life.

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