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# Learning in the digitally transforming world – challenges and chances

**Summary**

The contemporary university – as any other educational, social, business, or government institution – functions in condition of what David Harvey has called time-space compression: everything is happening here without distances, differences or frontiers; and everything is happening now without past or future. The very structure of the knowledge has changed: it has become complex, interdisciplinary, rather problem-based than discipline-based. Purely intellectual knowledge is no longer relevant; its true value is determined by its potential for commercial application. Besides, with constant advent of new technologies, both knowledge and skills turn obsolete in no time. Thus, the university must equip learners with tools, strategies and resources which would allow them to independently upgrade their knowledge and skills whenever demanded throughout their after-university professional or academic careers. In the present article, I outline new literacies essential for a learner to study in a technology-enhanced global classroom, and review the potential of the new technology for education. I then consider constructing Personal Learning Environments (PLEs) as a means to individualize and support learning in different contexts. Having gained attention of educators since 2004, PLE represents an evolving trend in sustainable education due to its potential to let learners create their own educational spaces in order to direct their own learning, to pursue individual educational goals, and to expand learning far beyond the classroom.

**Key words:** knowledge society, knowledge-based economy, PLE (Personal Learning Environment), lifelong learning, new literacies, OER (Open Educational Resources), OCW (OpenCourseWare) Consortium.

> University is a place where the young and the experienced can acquire not only knowledge and skills, but also the values and discipline of an educated mind, which are so essential to democracy; where our cultural and intellectual heritage is defended and propagated, even while our norms and beliefs are challenged; where leaders of our governments, commerce, and professions are nurtured; and where new knowledge is created through research and scholarship and applied through social engagement to serve society.
>
> (James J. Duderstadt et al. 2005)

## Introduction

In the present paper I discuss how the higher education is being transformed in the 21st century. The first part reviews the conditions of post-modernity, in which the contemporary university has to function, and the challenges imposed on educational institutions by ubiquitous digitization. The second part outlines the new literacies necessary for successful learning in the new conditions, alongside with the powerful potential of technology which alters the way of information delivery and scholarly communication, and offers opportunities for self-initiated lifelong learning. The final part discusses the methodological foundations for constructing Personal Learning Environments as a means to pursue learning, to integrate information from diverse resources and contexts (both Internet and paper-based), and to create conditions for active and meaningful learning experiences. The paper concludes with suggestion concerning the future of the university which will most likely result in its felicitous adaptation to the new digital reality while preserving its long-established mission of effective teaching and learning, research, and service to the society.

## Post-industrial era as a challenge to contemporary education

The impact of digitization on every sphere of contemporary society is a recognized fact. The university is not an exception. In present-day conditions, the university has found itself in the situation of unprecedented challenge: on the one hand, it should respond and adjust to the profound changes of the surrounding world; but on the other hand, the university cannot lose its academic prestige, intellectual features and authority. From time immemorial, the university

has been much like a *temple of knowledge*, a sacred place where the treasures of wisdom and knowledge were created and accumulated. The university's canonical activities have always been research, teaching, and engagement, with the core mission to promote individual and civic development (Duderstadt et al. 2005). The present-day situation, however, seems to be quite dynamic and unsteady, which leads to reflections on the future of the university in its conventional form and structure. Scholars and educators try to consider how the university will adapt to the digital reality, and what kind of transformations will be necessary on the level of university's activities (research, teaching and engagement), university's organization (its structure, management and financing), and university's modified mission in the knowledge-based society.

To outline the characteristics of postmodern society, I would concentrate on three basic features which in my view determine the contemporary situation most: (1) time-space compression; (2) rapid obsolescence of knowledge and information and need for sustainable lifelong learning; (3) specific attributes of contemporary knowledge and information.

(1) **Time-space compression.** Writing about economic, political, cultural, and social transformations occurring in the postmodern society, David Harvey depicts the phenomenon of what he called "time-space compression": the speed-up in the turnover times of capital, which became possible due to incorporating new technology in production, and which in its turn has caused parallel accelerations in exchange and consumption (Harvey 1992: 284). That resulted in increased consuming of not only physical goods, but also lifestyles and recreational activities (i.e. leisure, sports, pop music styles, games). We have even begun consuming services: business, educational, health, entertainment ones, etc. The society-wide effect of the accelerated consumption is in the feeling of volatility of the things around us and the general sense that "all that is solid melts into air" (ibid.: 286). On the global level, we turn into the "throwaway" society which consumes and later ruthlessly throws away – alongside with produced goods – values, life-styles, stable relationships, and attachments to things, habits, and people. The future is discounted into the present, and long-term planning has little sense, as the situation is too dynamic and it is impossible to predict its development on a longer scale. Harvey claims that new communication technologies, such as satellite communication systems, diminish the notion of "the space", since electronic technologies can virtually bring people and places together, allowing us to embrace the whole planet. Time and space as materialized and tangible dimensions of social life have disappeared. Spatial barriers have become less important and are gradually diminishing. In our ordinary daily life, different

worlds represented by national cuisines, music, television, entertainment, cinema, education are all brought together in the same space and time, and people can experience the world's geography through the vicarious cultures, either encountered face-to-face or via an electronic channel. Every sphere of postmodern life has been globalized. Harvey compares modern life to a collage, i.e. mixture, of various elements, old and new, produced by representatives of multiple cultures: "Disruptive spatiality triumphs over the coherence of perspective and narrative in postmodern fiction, in exactly the same way that imported beers coexist with local brews, local employment collapses under the weight of foreign competition, and all the divergent spaces of the world are assembled nightly as a collage of images upon the television screen" (ibid.: 302). Our sense of time-space compression declares itself in the feeling that we are functioning in a pulsing, speedy world, where everything is happening *here* without distances, differences or frontiers; and everything is happening *now* without past or future.'

(2) **Obsolescence of knowledge and information, and need for sustainable life-long learning.** Acceleration described by Harvey is also true in concern of the speed of creation and accumulation of knowledge and information. According to Sherwin Rosen, obsolescence is determined by the time factor, and it takes place because "stocks of knowledge available to society change from time to time" (Rosen 1975: 199). As research and innovation push forward the frontiers of various disciplines, the information once learned stops being topical. Sometimes newly discovered knowledge completes and deepens the previously constructed knowledge, sometimes it contradicts with the truths considered universal at an earlier time (ibid.: 199–200). In any case, information and knowledge constantly need upgrading, since with rapid development of new technologies, obsolescence of knowledge, skills and qualifications also gathers pace. There is a unanimity among scholars all over the world as for the need of lifelong learning and sustainable education for any worker in an advanced industrial society. A rigid specialist who does not invest in sustainable upgrading of his/her knowledge and skills is doomed for a professional failure on the market driven by technology and innovation. Lifelong learning is not a trend, but a necessity. As Gerhard Fischer reasonably notices, "lifelong learning is more than adult education or training – it is a mindset and a habit to acquire" (Fischer 1999: 21), and it must be seen as an integral part of education in future. The previous scheme of a divided lifetime devoted first to education and later to a professional career is no longer relevant. Throughout working career, a present-day specialist is likely to indulge in formal learning, provided by educational institutions, several times (take post-graduate courses, foreign languages and IT courses, training for a new

career, etc.). Graham Attwell sees contemporary learning as "multi episodic", meaning by "episodes" time spent on formal education (Attwell 2007: 21). Between those formal learning spans, however, there is no vacuum, considering an ambitious specialist attempts to foster his/her independent informal learning. Present learners can be of different ages, and they do not necessarily gain centralized formal education at a conventional school, but can acquire knowledge and skills in the context of authentic, self-directed problems, often via new media, at once applying gained knowledge and qualifications in practice (Attwell 2007; Fischer 1999).

(3) **Specific attributes of contemporary knowledge and information.** In the context of technological advent, the amount of data, information, and knowledge also accelerates exponentially. After Kazem Abhary et al. (2008: 1755), I understand *knowledge* as "construct formed by a spectrum of intellectual components, the simplest being *information*. *Information* is composed of yet a simpler form, termed *data* which are tentatively positioned at the boundary of knowledge strata". Paraphrasing this definition, information is raw material that – when processed by an individual – becomes his/her knowledge. Knowledge is an established system, which can continue to exist over a significant time-span, without losing its reliability. Knowledge encompassing a certain field that is for some reason distinguishable from other knowledge, constitutes a "disciplinae" (plural: "disciplinas") (ibid.: 1756).

To the attributes of contemporary knowledge I would relate its rapid obsolescence; its complexity, cross-, inter- and transdisciplinarity; its problem-based rather than discipline-based character; the demand for its applicability in real settings; and its shareability.

*Obsolescence* of information and knowledge, as mentioned earlier, is caused by the technological breakthrough of the latest decades which brought about time-space compression.

*Complexity* of information and knowledge is often encountered by researchers while trying to explore real-world problems which firstly appear to be too complex for just one or two disciplines, so that different components of the problem should be researched by methods and in borders of different disciplines or subdisciplines. According to Un-chol Shin (1986), we deal with *cross-disciplinary* knowledge in the case when disciplines exploring the components of the problem are of the same hierarchical level, and when axiometics of one discipline is imposed upon other disciplines. When concepts and ideas, equally well established within their respective disciplines, are integrated, and new meaning within new knowledge is created, this knowledge is *interdisciplinary*.

But if ideas from different disciplines are subsidiary parts coordinated by a teleological norm, then the newly acquired knowledge is *transdisciplinary*.

Complexity of present-day knowledge and its cross-, inter-, and transdisciplinary character explains the researchers' increasing doubts as for the appropriateness to divide knowledge into specific disciplines while exploring a research problem. Nowadays, more and more confident voices can be heard that a holistic approach in research and learning (i.e. *problem-based*, integrating knowledge from several disciplines) is more preferable than discipline-based.

*Applicability* of knowledge in real settings determines its relevance and significance: pure intellectual knowledge is nowadays considered of little value. Intellectual capacity of any worker in the knowledge-driven economy should be accompanied by his practical and entrepreneurial skills and qualifications. People want to benefit from education, coming to economic prosperity through it.

Due to technology, information and knowledge have become *shareable* through electronic channels. Participation and social interaction online take on various forms: collaboration, dialogue, monologue, discussion, reflection along with others. Information and knowledge sharing is a positive phenomenon due to its potential to enhance learning, make it more meaningful, and provoke reflection.

Notwithstanding the above mentioned peculiarities of the present-day digitized society, I am deeply convinced the university should preserve its traditional core mission, namely: contribute to the development of the society at the local, regional, national and international levels; provide learners with high-standard educational experiences; teach critical thinking, discipline, moral and ethical standards; develop in students the ability to listen, cooperate, interact, and respect the opinion of others; stimulate and support learners' creativity and innovation; build positive image of self, confidence, and pride. The university is to remain the place of intellectual interaction, innovative research, and learning.

Still, the university has to adapt to the ongoing transformations, otherwise students and society might stop treating it as a meaningful, trustworthy institution. The way of knowledge delivery should change: students should be allowed for greater independence in learning process and should feel responsible for their own learning outcomes. The role of the academic teacher should change: from the monopolist and disseminator of knowledge he/she should turn into a facilitator of student-centered learning, initiated by learners themselves. An educator should guide and assist his/her students in their learning experiences, but not dominate over them. University should equip students with tools and strategies which would allow graduates to learn independently and upgrade

their knowledge whenever they need it in their after-university working careers, i.e. prepare students for sustainable lifelong learning. New literacies should be mastered, among them digital literacy, critical thinking, sociocultural literacy, cognitive flexibility, skills to process hypertexts. The last but not the least is to prepare graduates to function in commercialized, competitive, international society in the conditions of speeding change and uncertainty, and to develop their entrepreneurial skills.

The challenges are multiple, and yet I am absolutely assured that educational establishments, ready to face those challenges, are not lacking, with the University of Warsaw being one of the examples of such progressive institutions, keeping up with the pace of time and adjusting its educational offer to the present-day situation. During the latest decade, academic administration at the University of Warsaw was completely digitized: currently all the supervision of the learning and teaching process is available online, beginning with application, timetables, exam results, students and teachers lists, to information about courses offered by the university, and all petitions and written requests which a student or a teacher could need during their learning/teaching experience with the university. Recording of all that information creates an individual's history: logging in to our personal page, we find out details of our academic career, petitions we have made, scholarship and grants we have won, groups of students whom we have studied together with. The registration to optional courses, lectures, foreign languages and physical training classes is also held online. The Center for Open and Multimedia Education offers both e-learning courses, and supports face-to-face courses, by providing a platform for teachers and students to have their own virtual space for communication and resource hosting. One more online project is dedicated to the research and teaching staff and PhD students, and is aimed at fostering the didactic potential of the university by investing into training, internship, scholarships, conferences and workshops for the researchers, teachers and PhD students. Another university service is forum, the students' informal meeting spot, where on numerous threads they can communicate and discuss current issues, not necessarily directly devoted to education. Totally, the University of Warsaw provides currently 24 official online services. The University Library has its own services, containing both electronic databases, and full-text publications: e-books, documents, scholarly journals repositories. Massive digitization of existing paper-based holdings is now taking place. Moreover, students and academic teachers have online access to the repositories of renowned international libraries, inter alia to publications by Springer publishing house, Taylor & Francis publishing house, Cambridge Companions Online, etc.

Dissertations and students' research papers are available online as well. The university supports e-mail services for students and staff. Thus, the University of Warsaw is adapting to the technology-dominated present-day reality and evidently sees digitization as an inevitable component of the present and the future.

## The need for new literacies and the potential of digital technology

**The need for new literacies.** Integration of technology into the learning paradigm definitely places new demands on students' skills and literacies. I would single out the following proficiencies critical for successful learning enhanced technologically: digital literacy, sociocultural literacy, literacies for processing information from the Internet sources (viz. sourcing, corroborating, and integrating of information), cognitive flexibility, argumentation, use of search engines. All those skills are not intuitive; they only develop with instruction and practice, and in my view, the university should contribute into students' becoming proficient holders of those vital literacies.

According to Cornel Reinhart (2008: 28), *digital literacy* should be an integral part of any academic discipline, not only the tenure for Computer Science. Students should possess fundamental understanding of computer technology, software, hardware, basic graphic and presentation programs, be able to use e-mail, social sites, search engines, to create simple Internet sites. In general, learners should develop essential skills to use computer and Internet with confidence. Moreover, students of certain faculties should be given the opportunity to develop their computer literacy relevant to the discipline they study (e.g. medical disciplines, engineering disciplines, accounting, translating and interpreting, etc.) which may demand utilizing specific profile software for creating technical drawings, programming special appliances and apparatus, or creating electronic databases, etc.

*Sociocultural literacy* is indispensable for effective communication with foreigners – representatives of other cultures. Since online social sites allow us to virtually encounter people from all over the world, both for educational and entertaining purposes, students should know how to communicate in a neutral manner, and how to interpret the interlocutor's behaviour.

Learning on the Internet can be overwhelming for some students, because this is a less predictable and much more abundant setting than a conventional learning environment. Students need a so called skill of *cognitive flexibility* to feel

comfortable while learning in online settings, i.e. combination of traits of low anxiety, independence, high tolerance of ambiguity, and internal locus of control (Wolfe 2001). Unfortunately, research indicates that students who do not possess those features, are very likely to be less effective learners on the Internet.

*Argumentative literacy* is the ability to persuade, debate, clarify one's perspective, evaluate, and make judgments. It develops students' analytical skills, sharpens critical thinking, logical and clear argumentation, synthesizes the information (Schmoker 2007). Apparently, the argumentative literacy was precious in the pre-digital era as well. Its importance, however, still increases with the necessity to approach more and more amounts of information, and to collaborate with more and more people.

*Skill to select the online search engine* most appropriate to the current objective is of great importance for the search to be successful. Students should be acquainted with the existing search engines, both stand-alone, such as Google, Yandex, Scopus, and incorporated into the library sites, e.g. Royal Society of Chemistry, which would enable access to academic databases.

A whole combination of skills is essential for processing information from online resources, namely hypertexts. Having proved it by their research, Anne Britt and Gareth Gabrys (2001) state, that reading hypertexts places on a reader an increased cognitive load. The reason is threefold: (1) nonlinear hypertexts lack coherence of linear texts; (2) while looking for resources in the Internet, a learner usually reads several shorter texts rather than one longer, so the amount of documents to be integrated is more considerable in comparison with paper-based resources; (3) quite often the information from the chosen sources turns out to be contradictory and inconsistent, so the reader must evaluate it, which is not usually demanded while studying paper-based resources. Britt & Gabrys (ibid.) further indicate the following basic literacies critical for online research and learning: *integration of information* (collecting information from different documents); *sourcing of information* (identification and evaluation of its credibility); and finally *corroboration of information* (validation of the newly gained information with other credible documents). The two former literacies are very similar to the critical thinking skill, which also helps to tell valuable and trustworthy information from unsound, biased, or unidentified data and information.

**The potential of technological tools in education.** With every decade, James Duderstadt et al. (2005) say, technology is becoming more powerful and cheaper. Education can and must benefit from its potential. The most promising advantages of technology consist in (1) providing extensive access to ample online resources; (2) and in the social nature of the new media.

Evidently, nowadays technology has greatly simplified the access to information and its transmission, thus providing a "fingertip access" (a metaphor used inter alia by Larry Johnson et al. (2009); Cornel Reinhart (2008); Christopher Wolfe (2001)) to an astonishing amount of free reliable resources. In pre-digital era the universities competed with one another for coming in possession of the best and rarest manuscripts, as those were the key to the accumulated knowledge of civilizations. The library was the heart of the university; the more precious and rare volumes it contained, the more prestigious and eminent the university was (Reinhart 2008).

Nowadays information infrastructure is not limited to a library belonging to a certain university and being located in a certain area. Nor do we have to be in the library in person to access its contents. Books, full-text articles, research papers, educational portals and software, educational games and simulations, authentic diagrams, photos, podcasts, MOOCs – are all available online. Via the Internet, learners can even gain access to scientific data from laboratories, or an astronomic observatory, or a surgeon's operating room.

Contemporary universities began building alliances: they are cooperating in creating international cyberinfrastructure for learning, which would contain high-quality educational resources legally available to educators and students anywhere in the world to use absolutely free for non-commercial purposes, without need to pay royalties or license fees for using them. Open Educational Resources (OER) include the whole range of materials: curriculum maps, course materials, textbooks, streaming videos, multimedia applications, podcasts (Butcher 2011). Many of them are allowed to be adopted and modified (for example, translated) according to the individual's needs and learning goals, and be further disseminated as new versions. The specific subset of OER is OpenCourseWare (OCW), which is "a free and open digital publication of high quality university-level educational materials. These materials are organized as courses, and often include course planning materials and evaluation tools as well as thematic content" (ibid.: 5). The initiative in creating the OpenCourseWare Consortium belonged to the Massachusetts Institute of Technology (MIT) in 1999 (Duderstadt et al. 2005), while in present days, namely in early 2014, the official portal of OpenCourseWare Consortium states, it unites over 280 organizations from 40 countries offering more than 30,000 learning modules in 29 languages (<www.ocwconsortium.org>). Among the sustaining members of the OCW Consortium are: Netease Information Technology Group, Delf University of Technology, Getulio Vargas Foundation from Brazil, the African Virtual University, Johns Hopkins Bloomberg School of Public Health, University of Michigan,

University of California, the Technical University of Madrid, Tufts University, Monterrey Institute of Technology and Higher Education, Korea OpenCourseWare Consortium, Taiwan OpenCourseWare Consortium, Japan OpenCourseWare Consortium. The mission of the Consortium is to "advance open education and its impact on global education (...), to engender a culture of openness in education to allow everyone, everywhere to access the education they desire, while providing a shared body of knowledge and best practices that can be drawn upon for innovative and effective approaches" (ibid.).

Another global educational initiative supported by renowned universities from all over the world is to create and spread over the Internet Massive Open Online Courses (MOOCs) to anyone with access to the Internet and – as a rule – at least basic knowledge of English, since the prevailing majority of courses are in English. MOOCs are another kind of OER. Completely free of charge, people gain opportunity to study college or university level courses, get learning materials such as video lectures and readings, create learning communities with other course participants, get precious experience of self-initiated constructivist learning. The Web platforms Coursera.org, Udacity.com, edX.org are the leading providers of MOOCs with the esteemed educational institutions such as the mentioned above Massachusetts Institute of Technology, Harvard University, Berkeley University of California, Stanford University, Australian National University, Boston University, the University of Hong Kong, Kyoto University, Catholic University of Louvain, Seoul National University, Technical University of Munich, ETH Zurich offering courses in various subjects, including computer science, mathematics, electronics, business, humanities, social science, chemistry, medicine and public health, engineering, education.

Those are global and generous projects of bringing education to the masses, which realizes and makes lifelong learning possible, and I think we should express our deepest respect and appreciation to the educational institutions indulging into such useful initiatives without direct financial benefits from it.

The other advantage of the digital technology rests in its **social nature**. Educators agree, the capacity of electronic channels to serve not only as the information delivery vehicle, but also as a virtual meeting spot for socializing is vital for education. Social software turns the Internet setting into the space for sharing and shaping learners' ideas and knowledge. Under social software all the tools which allow people to connect, communicate, and create networks are meant (Attwell 2007: 4). Whereas the primary aim of Web 1.0 was to host resources, Web 2.0 added the social component, enabling users to create their own content and to connect with each other via electronic channels: social

networking services, forums, blogs, instant messaging services, making possible both synchronous and asynchronous communication. At present, the Internet is the setting for creating and socializing. While connecting people, the Internet also connects their ideas, knowledge, and content produced by users. Appearance of interactive learning communities became possible, where students can learn with and from each other. Such learning communities can be really global in their extent, uniting international learners, teachers, and experts. With little effort, students can encounter via electronic channels masters from the field of their scientific interest, make contacts, join domain-specific scholarly communities, discuss, reflect and get feedback. Learning is neither limited by the classroom any longer, expanding far beyond the university campus, nor by the constraints of time and space. It is hard not to agree with Mitchel Resnick (2002: 36), that "in the digital age, learning can and must become a daylong and lifelong experience".

The previous hierarchy has been upset: educational institutions have lost their monopoly on possessing and disseminating knowledge, and the teacher is no longer an omniscient narrator, who transforms data and information to passive students. Since technology made content available, teachers can devote less classroom time to presentation of the learning material and collecting data, and can dedicate more classroom time to interaction with students, to stimulation students' creative work, to exploration of real-world research problems, to implication of theoretical knowledge in practice.

At the same time, educators agree that the mere access to information is not enough, nor does it guarantee the learner's success. Those loads of resources remain worthless without the learner's basic skills to select the necessary information, process it, adapt it to a certain task, and later use according to the individual's needs (Resnick 2002: 32; Wolfe 2001: 2). Just similarly the potential of learning and research communities remains not realized in case learners use social networks for solely entertainment purposes.

**A few concerns regarding ubiquitous digitization.** Those reflections on advantages for education brought about to the classroom by technology could not be complete without mentioning its downsides. The research has revealed that learning on the Internet places greater demand on a learner than traditional modes of instruction (Wolfe 2001: 2–3). Learners must be mature enough to be able to independently set educational goals and pursue them, which definitely imposes greater responsibility on students.

The Internet is changing daily, and the portals, utilized by a learner for his/her educational purposes, may change or disappear without a trace, together with all content, contexts, and contacts meaningful for the learner. In this respect,

Internet seems to be an ephemeral medium, and a decision to entirely depend on Internet resources and connections does not seems to be a wise one. There is also an issue of security of personal data on the Internet with the thread of intruders or hackers come into possession of our important information and data.

Relationships built entirely on the Internet can be quite shallow and fake due to online identities users may create; moreover, electronically mediated communication tends to be rather conformist. Internet abuse and Internet aggression are among negative Web experiences. Discussing with learners issues of their personal safety while studying and communicating electronically cannot lack from their teachers and parents, even on the university level.

Another issue is Internet addiction against which psychologists warn everybody, with especial accent on young people. The mechanism of building any addiction, not only the Internet one, is a complicated phenomenon, which affects some people, at the same time leaving others immune. Learners may not be conscious if they belong to the risk-group, but to be on the safe side it is vital to let Internet remain only a part of the whole individual's life which should include – beside its electronically mediated component – real-world meaningful activities, such as face-to-face communication, sport, hobby, entertainment, travelling.

With more and more segments of our vital activities demanding digital proficiency from users, social, economic and political exclusion is nowadays facilitated by the digital divide. Numerous initiatives have been taken to bridge the gap between those who can benefit from digital technology and those who cannot (see, for instance, the book: *ICTs and Sustainable Solutions for the Digital Divide: Theory and Perspectives*, by Jacques Steyn & Graeme Johanson (eds.), IGI Global, 2011). Being technologically illiterate, less privileged students are at threat of remaining in the margins of the society. In future, digital exclusion may provide to social and political exclusion, and even to the economic one, with the Internet turning into the 21st century global market, and with digital fluency becoming a prerequisite for obtaining jobs, for lifelong learning, and for successful functioning in any other sphere of the digitized society.

## Personal Learning Environment: the concept, technological solutions and pedagogical background

Presuming digital technology is so powerful, how can universities take advantage of it and implement it into the formal learning settings? In fact, numerous actions of digitization of a university are already taking place, but

I want to concentrate on the relatively new phenomenon of a Personal Learning Environment (PLE) which has gained broad attention in the educational community since November 2004, when Scott Wilson introduced the diagram of the future Virtual Learning Environment (VLE) at the JISC Interoperability Conference in Oxford, UK (Buchem et al. 2011). Wilson suggested that in the future all components of a learner's Virtual Learning Environment should be united by a learner's e-portfolio, a software application which would enable the learner to organize all his/her online learning episodes into the whole. The concept of Personal Learning Environment developed from the educators' discussion about the VLE. Along with Scott Wilson, the leading researchers of PLEs are Graham Attwell, Ilona Buchem, Alec Couros, Wendy Drexler, Stephen Downes. Since 2010, yearly conferences on PLEs have been initiated by Graham Attwell, the director of the research organization Pontydysgu in Wales, UK, studying technology-enhanced teaching and learning, e-learning, and web-based learning environment development.

The central idea of Personal Learning Environment is integration of an individual's learning sources and contexts into a holistic unity in order to organize and structure learning, so that the student could keep control over his/her data and contacts. EDUCAUSE defines Personal Learning Environment as a combination of "tools, communities, and services that constitute the individual educational platforms learners use to direct their own learning and pursue educational goals" (EDUCAUSE 2009). Ilona Buchem and Mar Perez-Sanagustin (2013: 7) understand Personal Learning environment as "self-directed uses of technology by the learner to support own learning". Attwell develops the definition by stressing that PLEs "are not an application but rather a new approach to the use of new technologies for learning" (Attwell 2007: 7). This approach provides learners with their own spaces for developing and sharing ideas. Since those spaces are under the learner's control, allowing for independence and heterogeneity, Personal Learning Environment is always learner-centered, tailored to the learner's educational needs.

Personal Learning Environment includes all sorts and episodes of learning: formal educational programmes, informal learning, workplace learning, learning from home, learning driven by problem solving, learning motivated by personal interest (Attwell 2007). PLE unites both online and traditional resources and communities, thus – as Buchem & Perez-Sanagustin (2013) put it – connects our virtual and physical spaces, our global and local learning experiences, our formal learning goals and personal learning goals. Gradually, students learn how to move between those spaces and adapt new forms of learning through multiple contexts, multiple channels, while pursuing multiple learning goals.

Since Personal Learning Environments emerge from various and robust platforms, their structure is flexible, dynamic, and unique with every learner: it is adjusted exactly to the individual's current needs, aims, and educational interests. The technical and online components of PLE are usually much more manifold than the physical ones, mainly because educational computer programs and online resources are very diverse and not bound to a certain physical location. The same concerns building online educational communities, not limited by a certain institution, but expanding worldwide.

Most frequently, creation of PLE occurs as a natural process, as a result of a learner's educational activity on the Internet, while building the system of online links of portals, sites, communities he/she regularly visits for studying. Not the entire learner's activity on the Internet is educational, thus not all the sites he/she actively uses constitute Personal Learning Environment. Buying books on the Internet, paying bills, or discussing cars on an international car forum cannot be considered elements of the PLE. Similarly, we should differentiate between educational communities, which unite learners for studying together, from the networks of interest, where people socialize on topics of interest. Whereas readers and commentators of a certain educational blog can constitute an educational community, football fans or rock music enthusiasts build an interest-based community, at least unless their communication starts making a positive impact on their education.

Progressive educators believe in powerful potential of PLE as an instrument for learner development, and therefore they assume, university should support students in constructing their PLEs (Attewell 2007; Buchem et al. 2011; Drexler 2010; Johnson et al. 2009). When teachers indulge in providing structuring PLEs into university courses, the task of the educator is to allow students to be rather independent in their learning, while achieving mandated curriculum goals. Students are given a free hand to create meaningful and motivating context, which would expand the curriculum of the information and learning communities personally meaningful for the students. On the basis of either a desktop application, or an Internet-based service, the teacher creates the framework for student learning, thus arranging a virtual space for housing students' digital content, sharing it, writing reflections, providing online discussions in topic groups and with the whole class, presenting the results of their work. This virtual space serves also as an administrative point of control over the course: here the teacher posts links to Web tools and recommended resources, both online and paper-based, leaves current announcements, and in general supervises students' scholarly activity. Students should feel confident to contact the teacher

whenever they need support, and the teacher should visit the class platform regularly, better on a daily basis, timely offering advice and counseling. Students are encouraged to seek and add to the class platform external resources of their own choice, and to make contacts with experts in the discipline they are studying, who are then may be invited to join the course learning community. The feedback is provided not only by the teacher, but also by peers and other members of the external learning community (Drexler 2010; EDUCAUSE 2009). The result of such guided structuring of Personal Learning Environments should be the emergence of a multiple personal network on the shared space of the class platform. In such a way, under the teacher's guidance, students learn how to organize their own educational work, set learning goals, and work systematically to achieve them, thus getting prepared for independent sustainable lifelong learning after graduation. Indeed, Personal Learning Environment might be central for learning in the future.

**Technological solutions to constructing Personal Learning Environment architecture.** To construct an effective PLE structure with its further integration into the formal learning process, a reliable technological platform is a must. The user-friendly interface alongside with the ease to operate it constitute the basic requirements to the technological tools chosen for developing students' Personal Learning Environments. Another critical attribute concerns the availability of the platform to learners after graduation: if a learner wants to maintain his/her account after graduating or moving the educational institution, it makes sense to choose an open resource, not funded by his/her current institution. Otherwise the learner could preserve his/her PLE only while being the student of that particular school. Such applications, based on open standards, as Moodle, ELGG, or Sakai, are widely used at universities and schools. They have most of the features of other commercial Learning Management Systems (LMSs), such as Blackboard, eCollege, or Desire2learn, but their primary advantage is that they remain in possession of the creator, i.e. the learner, and can be exploited as long as the learner wishes.

Mehmet Kesim & Hakan Altmpulluk (2013), however, are not that enthusiastic about utilizing Learning Management Systems for group PLEs construction, claiming that LMSs are rather teacher-centered, as the only person who is authorized to customize the system is the administrator, with other group members having no right to add or change the rubrics of the LMS. As follows, LMSs are not flexible and adaptive enough to satisfy learners' need for independence and creativity in education. Nevertheless, I think in case of individual, not group PLE construction, LMSs do have their advantages, first of all due to

their visualization: they help to build a very clear and precise architecture of learning resources and connections.

Another way of constructing PLE is on the basis of social software applications, such as Blog, Wiki, 360doc, with blogging becoming one of the most popular instructional tools (Attwell 2007). Some institutions include blogging as a recommended activity for students, but not included in the curriculum. Students are allowed to publish on their blogs whatever they want, with the main aim of recording their reflections which appear and develop with learning. Other institutions include blogging into the curriculum, as a means to structure personally discovered learning sources, teach writing skills and reflection, present projects, and others.

One more possibility is to use social aggregator applications as the learning platform. As the very name suggests, an aggregator (or a life-streaming tool) is the tool which connects on a single dashboard in chronological order all updated information from the variety of Internet sources: social sites, blogs, e-mail accounts, instant messenger, YouTube, etc. Google, Yahoo, ZOHO are among the most widely spread social aggregators. For example, iGoogle, i.e. a service of Google, alongside with well-known Gmail, Google Blog, Google Map and Google Translator, offers Google Calendar (for online scheduled management), Google Reader (for online RSS reading), Google Docs (for creation of collective Internet documents and possibility to edit other users' documents), Google+ (to support discussion groups and construct learning networks). The Google aggregator allows learners to adjust it to the individual needs: to add, remove, and rank the plug-ins.

Really Simple Syndication (RSS) is an extremely helpful protocol that filters and organizes vast amounts of Web information from the sites and portals the user has subscribed to, considerably saving his/her time and effort (EDUCAUSE 2007). It is another type of the Web aggregator, which has lately gained broad online expansion, and can be efficient in learning, due to its function to provide updates of the content meaningful and useful for the individual learner without the need to visit each site and portal in order to check for upgrades.

The broad variety of technological solutions enables learners to experiment and choose the one or several which suit their learning activities best. The technology, however, remains merely a tool to facilitate learning within a sound and well thought-over pedagogical design.

**Pedagogical foundations for constructing Personal Learning Environments.** Prior to integration of Personal Learning Environments into formal educational courses, clear pedagogical goals must be set alongside with solid pedagogical teaching/learning theory.

The 2009 Horizon Report affirms, "today's learners want to be active participants in the learning process – not mere listeners; they have a need to control their environments, and they are used to easy access to the staggering amount of content and knowledge available at their fingertips" (Johnson et al. 2009: 5). The need for student active participation in learning is recognized by educators (Attwell 2007; Buchem & Perez-Sanagustin 2013; Cooperstein & Kocevar-Weidinger 2004; Couros 2010; Drexler 2010; Resnick 2002). The principles of constructivism and connectivism learning paradigms correspond to the demand to allow students to be active constructors of their own learning.

Concepts of connectivism, introduced by Stehpen Downes (2009) and George Siemens (2005) bear close links to the theoretical framework of constructivism, advanced by John Dewey, Jean Piaget, Jerome Bruner, Lev Vygotski, David Kolb, and the followers. The accent in education must shift from being teacher-centered, or material-centered, to being learner-centered, meaning that learning must be designed around students's interests, talents, and passions. The central role in knowledge acquisition is given to the student, who actively participates in constructing the context for learning, through both individual and collective practices (Buchem et al. 2011). If we want students to be active in the classroom and outside, they should have the chance to influence their own learning process while examining authentic problems personally meaningful for them.

Principles of constructivism assume, information should not be delivered by a teacher to passive students within a rigid curriculum, but should be actively discovered and constructed by learners (Duderstadt 2005). For learning to be effective, it should be inductive: in their cognition, students move from experience to learning, i.e. learners' cognitive activity leads to concepts, not vice versa. Within learning scenarios students should be engaged in such activities through which they could develop skills and theoretical concepts. The aspects of constructivist lessons include four essentials: (1) learners construct their own meaning; (2) new learning builds on prior knowledge; (3) learning is enhanced by social interaction; (4) learning develops through authentic tasks (Cooperststein & Kocevar-Weidinger 2004). Social constructivism lays special accent on learning as a socially based experience: it is believed learning develops best in group situations through collaboration (Couros 2010), since learning is a social system with prominent importance of sharing knowledge, discovering together, working on mutual projects.

Connectivism underlines the importance of relationships and networks in learning, which gain central position in this learning paradigm. In my view, however, foundations of connectivism are very close to those of constructivism,

especially social constructivism. Thus, connectivism can be treated rather as a pedagogical view than an independent learning theory. George Siemens (2005) claims, constructivism theory which was developed in a time when learning was not impacted through technology, has turned obsolete in the contemporary technology-dominated world, where "the pipe is more important than the content within the pipe" (Siemens 2005), meaning that access to knowledge has become more important than the knowledge itself: the vital skill of the individual is to be able to plug into the sources that would provide access to the necessary knowledge. We are all connected via the Web, and therefore interdependent: our knowledge is no longer within us, it can be kept in databases, other people, information sources. The essence of learning and knowledge is the individual's capacity to connect to the right people and/or information sources at the right time, thus effectively nurturing the flow of information between the nods of the network. The epitome of connectivism, Siemens says, is the "amplification of learning, knowledge and understanding through the extension of a personal network" (ibid.). As stated by Stephen Downes (2009), in connectivism the product of the course is not the material students should master, but the *learner him/herself*: through learning, the individual's state should change, so that he/she becomes "more adapt, able to learn and interact, grow and develop" in the field of studying (Downes 2009, min. 5.05–5.40).

Learning scenarios based on the principles of both connectivism and constructivism can be realized in the framework of such broad pedagogical approaches as enquiry-based learning, cognitive apprenticeship, project method, method of learning contracts, collaborative learning and communities of practice, student-centered learning enhanced technologically, etc. Choosing the *pedagogical approaches* for the certain educational setting is the intermediate stage between the *pedagogical philosophy* (in our case, constructivism or connectivism), and designing *pedagogical strategies and tactics* (i.e. detailed plans, actions, activities and tasks, which the teacher would *offer* students to achieve the objectives set on the level of pedagogical philosophy and broad pedagogical approach) (Goodyear 2005: 83–6). Thus, the further stage of pedagogical design deals with working out pedagogical strategies and tactics, which may include (but certainly are not limited to) discussion, conference, debate, group work and pair work, academic writing and argumentation, writing critical or positive responses, providing examples, rewarding contributions, summarizing, relating content to the learner's previous experience, providing feedback, reflection, and assessment beside many others, appropriate for the individual learner, his/her learning goals, educational settings, learning styles, etc.

Peter Goodyear warns practitioners against being too careless about the two first stages of pedagogical design, namely agreeing on philosophy and broad pedagogical approaches, in favour of concentrating on more practical pedagogical strategies and tactics: "(...) philosophical differences within the team setting up a new course can lead to fatal divergence in the day to day operational work. It is not uncommon to find some members of a team believing that learners are poor at organizing themselves and learn best by being fed information in small amounts, while other members of the team want to promote active, student managed learning. The sooner such discrepancies are found, discussed and reconciled, the less likely is catastrophic failure" (Goodyear 2005: 83–4).

A number of universities do encourage students to create and actively use their Personal Learning Environments. The broad pedagogical approaches, strategies, and tactics on which a certain educational course is constructed may vary, but the core components are similar: that is constructivist/ connectivism learning theory as pedagogical philosophy, and the students' right to preserve their created PLEs after the university course is over. Among the universities experimenting with integration of PLE design into the curriculum, are the University of Bolton in the UK, the University of Warwick in Wales, the University of Barcelona in Spain, the University of Vienna in Austria, the University of British Columbia, the University of Mary Washington, the University of Florida in the USA, Athabasca University in Canada. Numerous publications discussing the results are available at the online libraries of those universities, on the sites of the scholars providing the research, alongside with ample paper-based scientific publications of academic publishing companies, such as Springer, Oxford University Press, Elsevier, and others.

## Conclusion

Since technology is evolving at an astonishing pace, it is difficult to predict the development of educational tools and methods even within a few coming decades. Evidently the Internet is not a panacea, but it holds great promise both as a learning technology, and as a learning context with the potential to enhance conventional learning methods. I believe that PLEs deserve further attention, research, and application, as they correspond to the social nature of a person, and help to unite formal and informal learning spaces, both virtual and real, where learners can explore, interact, learn from each other and from own experience

and reflection. At the same time I am more than certain that the university as an authoritative teaching/ learning institution and a research centre will continue to exist, most likely in its updated version, with lectures less bound to buildings and grounds, teachers supporting learners' initiative and creativity, and learners being more confident and responsible for their own learning outcomes.

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