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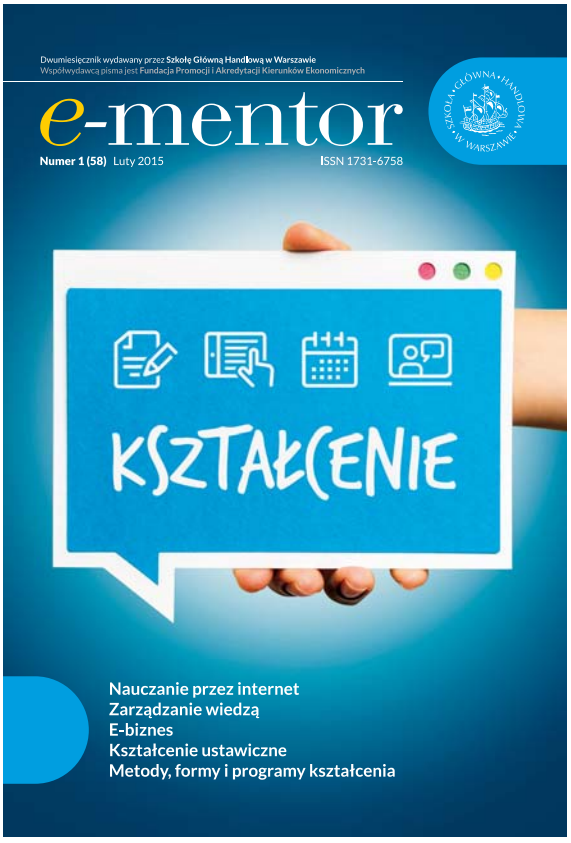

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Balancing stable educational goals with changing educational technologies: challenges and opportunities

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While considerable academic efforts have focused on integrating cutting-edge educational technologies into learning and instruction, it is not yet clear what effect the implementation of these technologies have had on enduring educational goals. This article reminds education's stakeholders that any plan for technology implementations should be based on serving broad educational goals. Regardless of how attractive cutting-edge technologies are, their application in education should be evaluated in light of enduring educational goals as summarized in the following: to develop responsible citizens who have basic knowledge and skills and who will become effective problem solvers and lifelong learners. This article reviews educational goals in several contexts to illustrate that while variations have evolved and many educational technologies have emerged, the basic educational goals have remained relatively stable. In reviewing the challenges and opportunities for emerging educational technologies, the basic argument herein is to begin with these basic educational goals rather than committing to the latest educational technological fad.

Educational systems around the world have experienced many changes over the past two and a half centuries in response to changes in technologies in the workplace and in society. The industrial age introduced many changes and many more have been introduced by the information age. Schools have faced the challenges of evolving goals and objectives, differences in race, wealth, age, and gender of targeted learners, time and space considerations, and resource constraints[1]. However, while the methods and approaches used to educate citizens have progressed, the primary goal of educating citizens has remained relatively constant in recent history[2]. Broadly stated, the basic goal is to have an educated population. More specifically, that typically includes having a literate population with basic knowledge and skills who can be or become productive workers, solve relevant and recurring problems, and continue to learn as circumstances allow or demand.

Society recognizes the importance of education. Quality education may be the single most powerful tool available for increasing economic growth, enhancing competitiveness and promoting inclusion[3]. Research suggests that countries with higher levels of citizen education tend to grow economically, while countries with lower educational levels tend to remain static in terms of their economies[4]. Workers with higher skill levels earn correspondingly higher wages. Countries with large numbers of professionals, particularly in science, engineering and mathematics, tend to compete more successfully in the global economy. Moreover, countries that enhance the human capital of the poor tend to flourish[5]. Luschei[6] and Rothman[7] find that education levels have a strong impact on both social and political areas within a society, including the health and poverty levels of citizens.

[1] D. Conley, *Common core development and substance*, „Social Policy Report" 2014, Vol. 28, No. 2, pp. 1–15.
[2] J.M. Spector, *Emerging educational technologies and research directions*, „Educational Technology & Society" 2013, Vol. 16, No. 2, pp. 21–30; F. Whelan, *Lessons learned: How good polices produce better schools*, 2013, http://www.acasus.com/wp-content/uploads/2014/02/R2-Lessons-Learned.pdf, [16.02.2015].
[3] T.F. Luschei, *Assessing the costs and benefits of educational technology*, [in:] J.M. Spector, M.D. Merrill, J. Elen, M.J. Bishop (eds.), *Handbook of research on educational communications and technology*, 4th ed., New York, NY, Springer, 2014.
[4] E. Hanushek, L. Woessmann, *The economics of international differences in educational achievement*, [in:] E.A. Hanushek, S.J. Machin, L. Woessmann (eds.), *Handbook of the economics of education*, Vol. 3, Amsterdam 2011, http://dx.doi.org/10.1016/B978-0-444-53429-3.00002-8; T.F. Luschei, *op.cit*.
[5] B. Bruns, M. Alain, R. Ramahatra, *Achieving universal primary education by 2015: A chance for every child*, World Bank, Washington, DC, 2003, http://dx.doi.org/10.1596/0-8213-5345-4; T.F. Luschei, *op.cit*.; A.J. Rotherham, D. Willingham, *21st century skills: The challenges ahead*, „Educational Leadership" 2009, Vol. 67, No. 1, pp. 16–21; M. Sanderson, *Educational and economic history: The good neighbours*, „History of Education" 2007, Vol. 36, No. 4/5, pp. 429–445, http://dx.doi.org/10.1080/00467600701496674.
[6] T.F. Luschei, *op.cit.*
[7] R. Rothman, *The common core takes hold*, „Education Next" 2014, Vol. 14, No. 3, pp. 16–22.

Education is considered a basic human right in many democratic societies. Indeed, the United Nations Educational, Scientific and Cultural Organization (UNESCO) considers education a basic human right[8]. The benefits of education are not limited to those who receive it directly. Educational benefits touch upon both the entire community and nation[9].

Educational goals

The common core educational goals that thread through the centuries and changes in technology have been summarized by Spector[10] as follows: „to develop responsible citizens who have basic knowledge and skills and who can become effective problem solvers and lifelong learners". Four persistent goals stand out according to Spector[11]: (a) developing responsible citizens (citizens who will understand, appreciate, and engage actively in civic and political life, with moral and civic virtues); (b) developing life-long learners (fostering life-long learning by nurturing the individual's unique talents to be competent and responsible citizens throughout their lives); (c) developing basic knowledge and literacy (so that individuals can actively participate in and contribute to society), and (d) developing critical thinking and problem-solving skills (examining ideas and thoughts before accepting them, developing criteria with which to evaluate and judge ideas, combining creative thinking and critical thinking, and reaching a resolution). The latter is perhaps the least emphasized among these four goals, but it is becoming one of the most important given changes brought about by new information and communication technologies (ICTs).

While the mission statement and the four above mentioned goals seem to be pervasive as well as basic; these goals are often emphasized and prioritized differently in various places and at various times, as just suggested. However, the argument here is that these goals and an associated educational mission can be found in one form or another in most developed and developing countries around the world.

In addition, these goals have been closely linked to individual rights in democratic societies despite the context of country-specific and historically-grounded implementations[12]. The role of technology in supporting these goals is elaborated in Spector, Johnson, & Young[13], and in various national educational technology plans.

Modern educational milestones

Europe has experienced two world wars, the [re-] occupation of various countries, religious strife, and many civil wars in the last few centuries, resulting in a rich and varied educational history. Many European philosophers have addressed and stressed educational goals over the centuries (e.g., Augustine, Descartes, Erasmus, Nietzsche, Plato, Rousseau, Spinoza, Voltaire, and Wittgenstein) and helped Europe become the cradle of modern education. Many of their philosophies are still widely used influencing pedagogies across various educational institutions. One example of that influence involves Victorian schools, where modern languages and mathematics were considered much more useful than courses such as Latin and Greek which were traditionally taught in a classical education context[14].

Maria Montessori merged several educational movements, shifting the interest from rote learning of basic knowledge and skills to social and humanistic goals, focusing on peace and the developmental, psychological and social needs of children. The introduction of *kindergartens* in Prussia was based on the belief that teaching a national language to young children would help to achieve national unity[15]. Before public schools were funded by governments, education for the poorer classes was provided by charity schools. Joseph Lancaster, in London, founded a free elementary school. Dr. Andrew Bell in Madras simultaneously developed a similar approach based on a method of instruction and delivery that was cumulative and repeatable. The focus at that time was to teach only grammar and bookkeeping, typically with one instructor and groups of 100 or more students. However, the instructor was helped by students who first learned the material and had the responsibility of helping to pass on that knowledge to the next group of entering students. These programs that emphasized the practical skill of bookkeeping helped people to start businesses and gave them

[8] Education for All Movement, http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-all, [16.02.2015].
[9] T.F. Luschei, *op.cit.*; K. Schwab, *The global competitiveness report 2010–2011*, Centre for Global Competitiveness and Performance, World Economic Forum, Geneva 2010.
[10] J.M. Spector, *Emerging educational technologies…*, *op.cit*.
[11] *Ibidem*.
[12] M.A. Clemens, *The long walk to school: International education goals in historical perspective: Working paper 37*, Center for Global Development, Washington, DC, 2004, http://www.cgdev.org/publication/long-walk-school-international-education-goals-historical-perspective-working-paper-37, http://dx.doi.org/10.2139/ssrn.549482, [16.02.2015]; M. Sanderson, *op.cit.*
[13] J.M. Spector, T.E. Johnson, P.A. Young, *An editorial on research and development in and with educational technology*, „Educational Technology Research & Development" 2014, Vol. 62, No. 1, pp. 1–12, http://dx.doi.org/10.1007/s11423-014-9331-z.
[14] A. Gutmann, *Democratic education*, Princeton University Press, Princeton, NJ, 1987.
[15] T.F. Luschei, *op.cit.*

the necessary knowledge and skills to continue their education at a low cost. By 1806, Lancaster's system for the education of poor children was the one most followed around the world[16]. Some of his programs developed into normal schools, now referred to as teachers' colleges; the method used in these schools is now called peer-tutoring.

Free school movements marked a turning point in education around the world. Struggling for the freedom to teach (academic freedom) and the right to learn (open access) led to more humanitarian, holistic, and non-authoritarian approaches to education[17]. That shift spread from Europe to the rest of the world. Another shift that continues to be found in educational systems around the world is the establishment of teacher-training as a legitimate function of universities. This European initiated movement in the USA led to the establishment of land-grant (public) institutions, called normal universities that focused on teacher training. Another example of this has been the establishment of a teaching college in Shanghai by St. John's University. This Chinese university eventually became more than a teacher's college and is now a leading public university in China – East China Normal University. The modern development of education in South Korea is a relatively recent phenomenon and has been largely influenced and supported by American institutions, most notably the Learning Systems Institute at Florida State University, under the leadership of Robert Morgan[18].

In summary, the development of educational institutions in Europe has progressively influenced higher education around the world. Moreover, this development has demonstrated a consistency with the four persisting goals of education in spite of the many technologies that were introduced in the period of time just covered (manipulatives for children, audio-visual tools, photographic and recording devices, etc.).

European educational goals

Tracking specific educational goals in Europe is beyond the scope of this study as the history is long and varied as suggested above. However, there are two cases where technology and national policy have played a role in dramatically transforming a European nation's education system – namely, Ireland and Finland. In Ireland, significant and sustained investments were made to support education at every level with the latest technologies, with an emphasis on reform at the primary and secondary level[19]. In Finland, in addition to creating a system of nationwide shared educational goals, the importance of teacher preparation and appropriate use of technologies was recognized and emphasized. Finnish teachers are required to have a master's degree, which may account for much of their education system's progress and transformation[20]. In both cases, the shared national prominence placed on educational goals was important in transforming their educational systems.

USA educational goals

Throughout the relatively short history of the USA, public educational goals have remained fairly stable. While the overriding stated goal of the American public education system to provide equal access to education for all citizens has remained unchanged[21], it is necessary to have an understanding of the motivations behind the USA's support of public education. The founders of the USA were very concerned that the citizenry needed to be educated in *good citizenship*. Thomas Jefferson wanted public schools to provide education focused on preparing voters to exercise their civic responsibilities (e.g., voting). The three *Rs* (Reading, wRiting and aRithmetic) were needed for reading documents related to the development of a new nation. Beyond that, Jefferson expected people to be knowledgeable about their trades to the level that they could be successful in their chosen enterprises[22]. The Industrial Revolution of the late 19th century had a major influence on American education. The advancing manufacturing technology was no longer contained by the limited number of skilled artisans. Prohibition, the depression, and the two world wars of the 20th century produced great philosophers like John Dewey who had a pervasive influence on education, especially in teacher preparation programs. Dewey[23] foresaw the need for critical thinking and social responsibility among the entire

[16] R. Rayman, *Joseph Lancaster's monitorial system of instruction and American Indian education, 1815-1838*, „History of Education Quarterly" 1981, Vol. 21, No. 4, pp. 395–409, http://dx.doi.org/10.2307/367922.

[17] A. Gutmann, *op.cit*; J.R. Miller, *Free schools, free people: Education and democracy after the 1960's*, State University of New York, Albany, NY, 2002.

[18] Florida State University – Our History, http://www.lsi.fsu.edu/About-LSI/Our-History, [16.02.2015].

[19] J. Walsh, *The politics of expansion: The transformation of educational policy in the Republic of Ireland*, Manchester University Press, Manchester 2009.

[20] P. Sahlberg, *Education policies for raising student learning: The Finnish approach*, „Journal of Education Policy" 2007, Vol. 22, No. 2, pp. 173–197, http://dx.doi.org/10.1080/02680930601158919.

[21] R. Rothstein, R. Jacobsen, *The goals of education*, Economic Policy Institute, Washington, DC, 2006, http://www.epi.org/publication/webfeatures_viewpoints_education_goals, [16.02.2015].

[22] T. Wrigley, *Rethinking education in an era of globalization*, „Journal for Critical Education Policy Studies" 2007, Vol. 5, No. 2.

[23] J. Dewey, *The child and the curriculum*, The University of Chicago Press, Chicago, IL, 1902; J. Dewey, *The school and society: Being three lectures, supplemented by a statement of the University Elementary School*, The University of Chicago Press, Chicago, IL, 1907; J. Dewey, *Modern principles in education*, Riverside Press, Cambridge, MA, 1909; J. Dewey, *Experience and education*, Kappa Delta Pi, New York, NY, 1938.

Table 1. Framework for strategic plan goals

Goal 1	Goal 2	Goal 3	Goal 4
Build a solid foundation for learning for all children	Reform the U.S. education system to help make it the best in the world	Ensure access for all to a high-quality postsecondary education and lifelong learning	Make the Education Department a high-performance organization

Note: see www2.ed.gov/pubs/stratplan2001-05/title.doc.

population[24] long before the notion of 21st century skills brought those to the forefront.

At the start of the 21st century, the focus shifted to economies having to compete on a global level. The U.S. Department of Education published the *Framework of Strategic Plan Goals and Objectives*[25]. Table 1 shows the four stated goals that frame the declared mission: „To ensure equal access to education and to promote educational excellence throughout the nation"[26]. While these goals are consistent with broad educational goals, they reflect a policy framework required for systemic improvement, similar to what occurred in Ireland and Finland.

Despite the USA educational mission and goals cited by Spector[27], the reality is that the divide between the well-educated and the under-educated has widened as a result of the explosion of digital technologies in the 20th and 21st centuries. The USA currently has a gap in the skilled labor force as well as an adult population that consistently participates at a low level (less than 50%) in national and state political issues. The USA's National Education Technology Plan, published in 2010 by the Department of Education[28], addressed learning, assessment, teaching, infrastructure and productivity. The plan remains the guiding strategy in the USA, emphasizing: learning that engages and empowers, assessments of competencies that matter in the long run, teacher preparation, continuing professional development, ongoing support for schools, and the required infrastructure to ensure productivity and the transformation of American education.

In 2012 Microsoft released a white paper called „A National Talent Strategy: Ideas for Securing U.S. Competitiveness and Economic Growth". That Microsoft document notes the lack of workers trained and prepared in STEM (science, technology, engineering, mathematics) fields along with a growing demand for those with strong STEM training. There are recommendations for strengthening K-16 education in STEM fields nationwide.

In summary, the USA has recognized and acted, at least in principle and with a national policy, in accordance with the goals cited by Spector[29]. However, systemic improvements in American education have yet to be fully realized, partly due to resource constraints and a polarized population that has yet to become well aligned with and supportive of national goals or the findings of the Microsoft report.

The point of this review of historical and recent developments in Europe and America is that for sustained progress and educational transformation to occur, it appears that educational objectives and strategies do not require cutting edge technologies (although they are useful). What is essential is the national will and wherewithal for supporting educational progress. Interestingly, many educational professionals support a return to fundamental educational goals with less emphasis on high tech solutions as evident in various research efforts in China[30], Mexico[31], South Korea[32], and elsewhere around the globe. Nevertheless, it the alignment of powerful new technologies with educational goals, including education for all, that is likely to be the key to success.

Global educational goals

The recognition that defining educational goals and objectives is an essential step to improvement has not been limited to Europe and the USA. Recently, several countries have shared their concerns and aspirations about reaching their educational goals and consequently, have merged their efforts to identify common goals and common solutions.

[24] V. Wang, *Understanding and promoting learning theories*, „International Forum of Teaching & Studies" 2012, Vol. 8, No. 2, pp. 5–11.
[25] *Framework of Strategic Plan Goals and Objectives*, U.S. Department of Education, 2001, www2.ed.gov/pubs/stratplan2001-05/title.doc, [16.02.2015].
[26] *Ibidem*.
[27] J.M. Spector, *Emerging educational technologies…*, *op.cit.*, pp. 21–30.
[28] National Education Technology Plan, http://tech.ed.gov/netp, [16.02.2015].
[29] J.M. Spector, *Emerging educational technologies…*, *op.cit.*, pp. 21–30.
[30] J.M. Spector, Y. Ren, *History of educational technology*, [in:] J.M. Spector, D. Ifenthaler, T.E. Johnson, W.C. Savenye, M.M. Wang (eds.), *Encyclopedia of Educational Technology*, Sage, Thousand Oaks, CA, 2015.
[31] C. Loser, J. Fajgenbaum, *A New Vision for Mexico 2042: Achieving prosperity for all*, „Global Journal of Emerging Market Economies" 2012, Vol. 4, No. 2, pp. 155–195, http://dx.doi.org/10.1177/097491011200400203.
[32] *Understanding Korean education: Volume 1: School curriculum in Korea,* Korean Educational Development Institute, 2007, http://search.korea.net:8080/intro_korea2008/koreans/pdf/02_03.pdf, [16.02.2015].

At the 2000 World Education Forum in Dakar, Senegal, a common education goal framework called the *Education for All* (EFA) was established (see the UNESCO site mentioned previously). Six EFA goals were defined and agreed upon by the international community with the focus on accelerating education progress by 2015; these goals can be mapped to the four basic educational goals with which we started with additional emphasis on access and quality:

1. Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children.
2. Ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to, and complete, free and compulsory primary education of good quality.
3. Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life-skills programmes.
4. Achieving a 50 per cent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults.
5. Eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality.
6. Improving all aspects of the quality of education and ensuring excellence of all so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills[33].

UNESCO's mission, since its establishment in 1945, has been to contribute to the building of peace, poverty eradication, lasting development and intercultural dialogue, with education as one of the principal activities to achieve those aims. UNESCO's educational objectives[34] are: to support the goals and objectives of the *Education for All* (EFA) initiative, to provide global and regional leadership in education, to strengthen education systems worldwide from early childhood to the adult years, and to respond to contemporary global challenges through education.

OECD (Organization for Economic Co-operation and Development[35]) is an international organization aimed at promoting policies that will improve the economic and social well-being of people around the world[36]. Since 2000, OECD has had two education-related millennium development goals: (1) universal primary education (by 2015 children everywhere will be able to complete a full course of primary schooling, see Table 1), and (2) the elimination of gender disparity in primary and secondary schooling. OECD contributed to the definition of learning goals and targets, based on the Program for International Student Assessment (PISA). PISA provides comprehensive and rigorous international assessment of learning outcomes (primarily in mathematics, reading and science) in education. More than 70 counties participate in PISA every year.

Challenges and opportunities in changing technology

Spector[37] states that „Learning essentially involves a change in abilities, attitudes, beliefs, capabilities, knowledge, mental models, patterns of interaction or skills; these changes may be localized within an individual, a group of individuals, an organization, or perhaps even a society". In order for these (directly or indirectly observable) changes to be called learning, they should persist over time and across a variety of distractions[38].

Most developed and developing countries in Europe, Australia, Asia, and South America support public education and are dealing with a rapidly changing technological environment[39]. The promises of radical change and dramatic transformation of learning and instruction that typically accompany each new technology have yet to be realized[40]. While the potential for significant improvement in learning and instruction using new technologies clearly exists, the resources, vision, practical expertise, and the will of all to make those improvements is often lacking. A few distinguished researchers and bright scholars are not the ones who can or will make significant and persisting improvements. All that researchers and scholars can do is to suggest promising directions.

In addressing these 21st century challenges and opportunities, Woolf (2010) suggests (a) new designs that include user modeling, (b) mobile and network tools, (c) rich interfaces and environments, including gamification and intelligent systems, and (d) educational data mining. However, Woolf[41] points out that

[33] Retrieved from: http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-all/efa-goals/ and quoted from that website.
[34] Education for the 21st century, http://en.unesco.org/themes/education-21st-century, [16.02.2015].
[35] OECD, http://www.oecd.org.
[36] T.F. Luschei, *op.cit.*
[37] J.M. Spector, *Towards a philosophy of instruction*, „Educational Technology & Society" 2000, Vol. 3, No. 3, p. 523.
[38] *Ibidem*; J.M. Spector, T.E. Johnson, P.A. Young, *op.cit.*
[39] K. Schwab, *op.cit.*
[40] J.M. Spector, Y. Ren, *op.cit.*
[41] B.P. Woolf, *A roadmap for education technology*, National Science Foundation, Washington, DC, 2010, https://hal.archives-ouvertes.fr/hal-00588291, p. 6.

technology is not the answer unless it can be used for: „Specifically personalizing education, assessing student learning, supporting social learning, diminishing boundaries, developing alternative teaching strategies, enhancing the role of stakeholders, and addressing policy changes".

In the USA there are major players contributing to the software side creating new opportunities for education. Publishing companies like Pearson are currently developing technology-driven curricula that meet the Common Core initiatives that are designed to drive the USA's K-12 programs[42]. Small startup companies with innovative ideas like the Khan Academy, with Microsoft support, have developed new learning strategies, one of which they refer to as the flipped classroom[43]. The New Media Consortium (NMC) sees promise in a flipped classroom approach, which NMC defines as „a model of learning that rearranges how time is spent both in and out of class to shift the ownership of learning from the educators to the students. In the flipped classroom model, valuable class time is devoted to more active, project-based learning where students work together to solve local or global challenges — or other real-world applications — to gain a deeper understanding of the subject"[44].

While educational technology integration is a challenge it has created the interest and opportunity for education systems to better define their goals and objectives. Many countries (large and small; rich and poor; with varied ethnic, religious, language and cultural traditions) have united with regard to their common interests and are identifying what is possible for children 9 to 13 years of age to know and to be able to do, thus establishing new opportunities to improve personal and societal performance. Likewise, scholars and researchers from all over the world have been exploring the issue of emerging educational technologies and their impact for years. Examples include:

1. the New Media Consortium's *Horizon Report*[45];
2. the *Roadmap for Education Technology*[46];
3. the European STELLAR project[47];
4. the GaLA: Games and Learning Alliance[48];
5. the IEEE Technical Committee on Learning Technology[49]; and
6. The National Technology Leadership Coalition[50].

Each of these is briefly reviewed to show a convergence on promising technologies that are likely to have an impact, given the will to support and sustain system and nationwide efforts.

The New Media Consortium's Horizon Report (NMC)

The New Media Consortium (NMC) is a not-for-profit consortium of various organizations dedicated to research and application of new media and technologies in the area of learning transfer. Beginning in 2002, NMC has administered the Horizon Project, an ongoing research-oriented effort that seeks to identify and describe emerging technologies likely to have a large impact on teaching, learning, or creative expression. On a yearly basis, the research focus is on discovery, knowledge-gathering, vetting, exploration, and knowledge sharing research likely to impact learning and instruction. By engaging in a series of conversations that includes more than 400 technology professionals, campus technologists, faculty leaders from colleges and universities, and representatives of leading corporations from around the world NMC explores and forecasts the impact of emerging technologies across all learning sectors. NMC's annual *Horizon Reports* are the culmination of their research efforts.

Table 2 is adapted from the *Horizon Reports* and shows the significant challenges discussed in each year's report from 2004 to 2014, including predicted timelines for the featured set of technologies being adopted by a significant number of colleges and universities. This table shows the emerging technologies expected to have a large impact over the following five years in education all around the world, as well as the significant challenges and constraints for teaching, learning, and creative inquiry to adopt those technologies, according to the annual NMC Horizon Reports of that period of 10 years.

Each of these technologies is described in detail in the main body of each of the reports, as well as the reasons why those technologies are considered relevant to teaching, learning and/or creative inquiry. One might observe that an ongoing constraint has been and continues to be the need to value and integrate professional development into the culture of the schools, and more recently, the challenges to fulfill the needs of today's students. As stated in the *NMC Horizon Report: 2014 K-12 Edition*, these trends, challenges and technologies are having and will continue to have a significant impact on the ways in which schools approach the core missions of teaching, learning, and creative inquiry not only in developed countries but also in economically disadvantaged places.

[42] R. Rothman, *op.cit.*
[43] D.A. Kaplan, *Bill Gates' favorite teacher*, „Fortune" 2010, Vol. 162, No. 4, pp. 71–73.
[44] L. Johnson, S. Adams, V. Estrada, A. Freeman, *The NMC Horizon Report: 2014 Higher Education Edition*, Austin, Texas, 2014.
[45] New Media Consortium, www.nmc.org, [16.02.2015].
[46] A Roadmap for Education Technology, Beverly Park Woolf, 2010, http://www.cra.org/ccc/files/docs/groe/GROE%20Roadmap%20for%20Education%20Technology%20Final%20Report.pdf, [16.02.2014].
[47] TELeurope, http://www.teleurope.eu/pg/frontpage, [16.02.2015].
[48] Games and Learning Alliance, http://www.galanoe.eu, [16.02.2015].
[49] IEEE Technical Committee on Learning Technology, http://www.ieeetclt.org, [16.02.2015].
[50] National Technology Leadership Coalition, http://ntlcoalition.org, [16.02.2015].

Table 2. Challenges to adopt emerging technologies from 2004–2014 from the Horizon Reports

Significant challenges		Broad adoption expected within:		
		One year or less	Three-to-Five Years	Four-to-Five Years
2014	Low Digital Fluency of Faculty Relative Lack of Rewards for Teaching Competition from New Models of Education Scaling Teaching Innovations Expanding Access Keeping Education Relevant http://www.nmc.org/publications/2014-horizon-report-higher-ed	**Flipped Classroom and Learning Analytics**	**3D Printing-Games and Gamification**	**Quantified Self and Virtual Assistants**
2013	Faculty training lacking digital media literacy Scalable modes of assessment needed for new scholarly forms of authoring, publishing and researching Education Processes and Practices limit new technologies Technology and Practices are not supporting the demand for personalized learning Most academics are not using new technologies for learning, teaching nor research. http://www.nmc.org/pdf/2013-horizon-report-k12.pdf	**MOOCs and Tablet Computing**	**Games & Gamification and Learning Analytics**	**3D Printing and Wearable Technology**
2012	Economic pressures and new models of education are bringing unprecedented competition to the traditional models of higher education. Appropriate metrics of evaluation lag the emergence of new scholarly forms of authoring, publishing, and researching. Digital Media Literacy as a key skill in every discipline and profession Institutional barriers impede moving forward with emerging technologies Significant challenges for libraries and university collections to document scholarship http://www.nmc.org/pdf/2012-horizon-report-HE.pdf	**Mobile apps and Tablet Computing**	**Game based Learning and Learning Analytics**	**Gesture-Based Computing and Internet of things**
2011	Digital Media Literacy as a key skill in every discipline and profession Appropriate metrics of evaluation for new forms of authoring, publishing and researching Economic pressures and new models of education are bringing unprecedented competition to the traditional models of higher education. Keeping pace with the rapid proliferation of information, software tools and devices is challenging for students and teachers alike. http://www.nmc.org/pdf/2011-Horizon-Report.pdf	**Electronic Books and Mobiles**	**Augmented Reality and Game-Based Learning**	**Gesture-Based Computing and Learning Analytics**
2010	The role of the academy and the way we prepare students for their future lives is changing The work of students is seen as collaborative by nature and there is more collaboration between departments Appropriate metrics for evaluating new scholarly forms of authoring, publishing and researching are needed. Digital media literacy as a key skill in every discipline and profession. Institutions increasingly focus more narrowly on key goals due to shrinking budgets. http://www.nmc.org/pdf/2010-Horizon-Report.pdf	**Mobile Computing and Open Content**	**Electronic Books and Simple Augmented Reality**	**Gesture-Based Computing and Visual Data Analysis**
2009	A growing need for formal instruction in key new skills, including information literacy, visual literacy and technological literacy. Students are different but a lot of educational material is not. There is a need for innovation and leadership at all levels of the academy. It is expected to measure and prove through formal assessment that our students are learning. Higher education is expected to make use of and to deliver services, content and media to mobile devices. http://www.nmc.org/pdf/2009-Horizon-Report.pdf	**Mobiles and Cloud Computing**	**Geo-Everything and The Personal Web**	**Semantic-Aware Applications and Smart Objects**

cont. Table 2

Significant challenges		Broad adoption expected within:		
		One year or less	Three-to-Five Years	Four-to-Five Years
2008	There is a need for innovation and leadership at all levels of the academy. Higher education is expected to make use of and to deliver services, content and media to mobile and personal devices. The renewed emphasis on collaborative learning is pushing the educational community to develop new forms of interaction and assessment. There is a need to provide formal instruction in information, visual and technological literacy as well as in how to create meaningful content with today's tools. http://www.nmc.org/pdf/2008-Horizon-Report.pdf	**Grassroots Video and Collaboration Webs**	**Mobile Broadband and Data Mashups**	**Collective Intelligence and Social Operating Systems**
2007	Assessment of new forms of work continues to present a challenge to educators and peer reviewers. There are significant shifts taking place in scholarship, research, creative expression, and learning, and a profound need for leadership at the highest levels of the academy that can see the opportunities in these shifts and carry them forward. Issues of intellectual property and copyright continue to affect how scholarly work is done. There is a skills gap between understanding how to use tools for media creation and how to create meaningful content. The renewed emphasis on collaborative learning is pushing the educational community to develop new forms of interaction and assessment. Higher education is facing a growing expectation to deliver services, content and media to mobile and personal devices. http://www.nmc.org/pdf/2007_Horizon_Report.pdf	**User Created Content and Social Networking**	**Mobile Phones and Virtual Worlds**	**The New Scholarship &Emerging Forms of Publication and Massively Multiplayer Educational Gaming**
2006	Peer review and other academic processes, such as promotion and tenure reviews, increasingly do not reflect the ways scholarship actually is conducted. Information literacy should not be considered a given, even among „net-gen" students. Intellectual property concerns and the management of digital rights and assets continue to loom as largely unaddressed issues. The typical approach of experimentally deploying new technologies on campuses does not include processes to quickly scale them up to broad usage when they work, and often creates its own obstacles to full deployment. The phenomenon of technological „churn" is bringing new kinds of support challenges. http://www.nmc.org/pdf/2006_Horizon_Report.pdf	**Social Computing and Personal Broadcasting**	**The Phones in their Pockets and Educational Gaming**	**Augmented Reality and Enhanced Visualization and Context-Aware Environments and Devices**
2005	All these 6 technologies chosen for the 2005 Horizon Report are seeing significant development in the private sector, but their applications for higher education are still unfolding. The underlying technologies fade into the background while collaboration and communication are paramount. Familiarity with the toolset may lead to increasingly creative approaches to learning on the part of students. http://www.nmc.org/pdf/2005_Horizon_Report.pdf	**Extended Learning and Ubiquitous Wireless**	**Intelligent Searching and Educational Gaming**	**Social Networks & Knowledge Webs and Context-Aware Computing/ Augmented Reality**
2004	The existing body of knowledge is sufficient but not widely understood. Good learning-design models need to be made more accessible to people charged with the authoring of learning objects and higher-level-components. Tools need to be developed that make the use of these practices automatic and transparent to authors and other aggregators of content. Quality standards need to be articulated so learning objects can be certified as meeting minimum criteria for effectiveness. http://www.nmc.org/pdf/2004_Horizon_Report.pdf	**Learning Objects and Scalable Vector Graphics (SVG)**	**Rapid Prototyping and Multimodal Interfaces**	**Context-Aware Computing and Knowledge Webs**
2003	Elusive Vision: Challenges Impeding the Learning Object Economy by Laurence F. Johnson, New Media Consortium June 2003 http://www.nmc.org/pdf/Elusive_Vision.pdf			

Note: compiled from NMC Horizon Reports 2003 to 2014.

STELLAR

STELLAR (Sustaining Technology Enhanced Learning at a LARge scale, http://stellarnet.eu) was a European Commission network of excellence project that represented the efforts of leading European universities and corporations to create a unified and ongoing effective community in the area of technology-enhanced learning. The STELLAR project developed TELeurope, which is a community of researchers, developers, teachers, industrialists and others with an interest in technology-enhanced learning with the challenge of identifying problems at the interface of social and technical sciences. Many of the findings, tools and technologies involved in the STELLAR project are available at no cost on the TELeurope Website.

GaLA: Games and Learning Alliance

History has demonstrated that the use of games can support early learning (simple tasks – easy to align game goal with learning goal). Motivational aspects of games and game technologies have attracted many people to develop communities dedicated to game-based learning. GaLA (Games and Learning Alliance) is a European Commission network of excellence projects (ended in December 2014) that promoted using games and aspects of games to promote learning. This network of excellence focused on game-based learning and built on the success of the STELLAR project. GaLA arose from the acknowledgment of the potential of serious games (SGs) for education and training and the need to address the challenges of the stakeholders of SGs in Europe (users, researchers, developers/industry, and educators). GaLA aimed to create a European serious game society (now in place) and build a European Virtual Research Centre (undergoing development) aimed at gathering, integrating, harmonizing and coordinating research on game-based learning. The focus of GaLA shifted from serious games (replacing entire units of instruction with games) to gamification – that is, using aspects of games to improve and enhance existing units of instruction. The reason for the shift is that as learning goals become more complex and at a higher level, it is quite difficult to clearly align game goals with learning goals and outcomes. GaLA will continue to exist after the project, as is usual for European networks of excellence, and continue to disseminate knowledge, best practices and tools as for the international community[51].

Technical Committee on Learning Technology (TCLT)

Recognizing the challenge of preparing technology teachers, the IEEE Technical Committee on Learning Technology (TCLT) established a Working Committee to develop specifications for a framework for new curricula for advanced learning technologies as a response to the demands and the potential of new and emerging technologies[52]. The effort resulted in a five competency framework (listed below) that are briefly characterized as the context for more detailed technology curricula topical content aimed at preparing instructional technologists and educational information scientists for the 21st century[53]:

1. „Knowledge competence domain – this domain includes those competences concerned with demonstrating knowledge and understanding of learning theories, different types of advanced learning technologies (including those cited in the *Roadmap* and *Horizon Reports*), technology based pedagogies, and associated research and development.
2. Process competence domain – this domain focuses on skills in making effective use of tools and technologies to promote learning in the 21st century; a variety of tools ranging from those which support virtual learning environments to those which pertain to simulation and gaming.
3. Application process domain – this domain concerns the application of advanced learning technologies in practice and actual educational settings, including the full range of life-cycle issues from analysis and planning to implementation and evaluation.
4. Personal and social competence domain – the report emphasizes the need to support and develop social and collaboration skills while developing autonomous and independent learning skills vital to lifelong learning in the information age.
5. Innovative and creative competence domain – this domain specifically recognizes that technologies will continue to change and that there is a need to be flexible and creative in making effective use of new technologies; becoming effective change agents within the education system is an important competence domain for instructional technologists and information scientists".

As of yet, the TCLT's framework for advanced learning technologies curricula has not received broad support across institutions of higher education, although parts have been implemented in some graduate programs.

National Technology Leadership Coalition (NTLC)

The National Technology Leadership Coalition[54] is an American consortium of educational technology association leaders that is dedicated to furthering the

[51] Serious Games Society, http://seriousgamessociety.org, [16.02.2015].
[52] R. Hartley, Kinshuk, R. Koper, T. Okamoto J.M. Spector, *The education and training of learning technologists: A competences approach*, „Educational Technology & Society" 2010, Vol. 13, No. 2, pp. 206–216.
[53] J.M. Spector, *Emerging educational technologies…*, *op.cit.*, p. 26.
[54] National Technology Leadership Coaltion, http://ntlcoalition.org, [16.02.2015].

appropriate use of technologies to improve learning and instruction. What is noteworthy about this organization is its sponsorship of the annual National Technology Leadership Summit meeting in which policy, research and practice initiatives are pursued.

Recent meetings have emphasized (a) a need for policy initiatives that are practical given the many constraints that exist across the USA, (b) a need for serious attempts to measure and report outcomes of technology initiatives, (c) a need to critically examine the next generation science standards that are aimed at integrating engineering concepts into science education at all levels, and (d) the need to conduct replication studies in order to build a scientific basis for advances in the use of educational technologies.

An interesting series of efforts in the last three years concerned 3D printing (a promising technology cited by NMC) and the next generation science standards. Specifically, while those standards sound reasonable, when several groups tried to implement them, the finding was that a great deal of scaffolding was required for students and significant support for teachers was needed as well. The associated Maker Movement[55] has promise but what remain critical are the educational goals and the preparation of teachers in using Maker tools and technologies in support of those goals and associated teaching standards.

Technology integration

The *NMC 2014 K-12 Horizon Report* examines the immediate consequences of the inclusion of these technologies into the education process[56]. NMC points out that if the technology changes the roles of teachers, then teachers must undergo a change. The report suggests that teachers will move from a role as the source of learning to the manager or facilitator of learning. Teachers will be responsible for motivating the students to accept new approaches into deeper learning. As new intuitive technologies are developed and implemented in the education system, traditional classroom experiences will be replaced with hybrid learning strategies. This will include both teacher student face to face time in traditional setting, as well as online engagement between teachers, fellow students, and open educational resources. Most significant in the long term, the above changes will force the role of schools to undergo serious changes.

The *NMC 2014 Higher Education Horizon Repor*t addresses the need to anticipate the changes the new technologies will bring[57]. The reports explain the need for „Agile Approaches to Change". The report emphasizes the need to reduce bureaucratic resistance to new technologies while preparing for the next round of newer technologies. The NMC[58] explains that the research paradigm is a supportive model for „nurturing entrepreneurship within their [university] infrastructure and teaching practices".

Researchers and policymakers around the world have to continue to devote their efforts to find answers to the questions of what works to improve schools. They should strategize on how to transform every school to be an excellent school, delivering excellent teaching and learning across an entire system[59] According to the *Lessons Learned: How Good Policies Produce Better Schools*[60], achieving good performance is not about how much money is spent or how many teachers are employed. For example, Finland tops the world in educational achievement despite spending less on students in its schools than most other developed countries and much less than its neighbors. This is according to the results from the series of tests the OECD runs every three years in almost 70 countries known as PISA, which showed that Finnish students not only score higher in tests, but they also read more books, visit libraries more often, like school more and have better relationships with their teachers than students in other countries[61].

Another example is Singapore. In 1965 when Singapore won their independence, their level of education was one of the lowest in the world, yet it quickly developed into one of the highest performing educational systems in the world. Singapore adopted seven crucial strategies necessary to ensure that children leave school with the required values, skills, and knowledge they need to succeed[62]:

- Having fewer but better teachers.
- Getting the right people to become teachers.
- Ensuring that every school has effective leadership.
- Setting high standards and measuring whether they are achieved.
- Creating structures which empower people, hold them accountable, and encourage collaboration.
- Investing in building teachers' professional knowledge and skills.
- Continuously challenging inequity in educational performance.

[55] MakerFaire, http://makerfaire.com/maker-movement, [16.02.2015].
[56] L. Johnson, S. Adams Becker, V. Estrada, A. Freeman, *NMC Horizon Report: 2014 K-12 Edition*, The New Media Consortium, Austin, Texas, 2014.
[57] L. Johnson, S. Adams, V. Estrada, A. Freeman, *The NMC Horizon Report: 2014 Higher Education Edition*, Austin, Texas, 2014, p. 16.
[58] *Ibidem*.
[59] A.J. Rotherham, D. Willingham, *21st century skills*…, *op.cit.*, pp. 16–21.
[60] F. Whelan, *Lessons learned: How good polices produce better schools*, 2013, http://www.acasus.com/wp-content/uploads/2014/02/R2-Lessons-Learned.pdf, [16.02.2015].
[61] *Ibidem*.
[62] *Ibidem*.

According to David Hogan[63], Honorary Professor at the University of Queensland, „Singapore's unique configuration of historical experience, instruction, institutional arrangements and cultural beliefs has produced an exceptionally effective and successful system" (n.p.). He noted that „there is much that other jurisdictions can learn about the limits and possibilities of their own systems from a more" (n.p.) conscientious examination of the Singapore model.

Concluding remarks

This review is intended to provide a background for a wide range of educational technology endeavors while examining the challenges and opportunities of making effective use of educational technologies. However, despite the potential of these technologies, we conclude that while often used to support specific educational objectives, they must support a society's overall broader educational goals. Our historical overview indicated that for over two centuries (1800 to 2000) the USA's emphasis in education (educational goals adopted from Europe) has only changed twice and these changes are consistent with the four enduring goals identified at the beginning of this article[64]. Similar developments were noted in Europe, emphasizing the point that educational goals are relatively stable despite identifiable shifts among the prioritization of specific objectives.

While new technologies offer opportunities for education and research, we should remember the challenges of the un-kept promises of the past as new technologies were introduced into education. Technology in and of itself is neither good nor bad. While technologies can be used to improve learning and instruction, they can also disenfranchise schools, teachers, and students when adequate financial and technical support is unavailable. The challenge the educational community faces is simply to make effective, efficient, and sustainable use of new technologies. As always, the goal is to help people learn better – namely, to develop responsible and literate citizens, lifelong learners, skilled and effective problem solvers, and critical thinkers who will lead the next generation into an even brighter future.

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[64] J.M. Spector, *Emerging educational technologies…*, *op.cit.*

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Polecamy

William D. Eggers, Paul Macmillan
Rewolucja rozwiązań. Współpraca pomiędzy biznesem, rządami oraz przedsiębiorstwami społecznymi na rzecz rozwiązywania największych problemów współczesnego świata
Poltext, Warszawa 2014

Autorzy książki doskonale zdają sobie sprawę z tego, że państwo samo nie poradzi sobie z problemami społecznymi i gospodarczymi. Przekonują, że tylko ścisła współpraca pomiędzy rządem, biznesem i organizacjami społecznymi może przyczynić się do poprawy sytuacji gospodarczej całego społeczeństwa. Swoje rozważania ilustrują wieloma przykładami takiej właśnie współpracy wpływającej na podniesienie jakości życia i umożliwiającej rozwiązywanie istniejących problemów. Książka ta może stanowić inspirację dla każdego, kto chciałby działać na rzecz lokalnej społeczności.
Publikację można nabyć w księgarni internetowej wydawnictwa: **http://www.poltext.pl**.

Konferencja *Edukacja ekonomiczna w XXI wieku*, 11 kwietnia 2015 r., Warszawa

W dniu 11 kwietnia 2015 r. Forum Obywatelskiego Rozwoju organizuje konferencję pt. *Edukacja ekonomiczna w XXI wieku*, która adresowana jest do nauczycieli wiedzy o społeczeństwie i podstaw przedsiębiorczości w gimnazjach i szkołach ponadgimnazjalnych.
Konferencja składać się będzie z trzech części. Część pierwsza będzie mieć charakter wykładowy. Prelekcje wygłoszą m.in. prof. Leszek Balcerowicz, dr Katarzyna Kopczewska i Jan Wróbel. Drugą część konferencji stanowić będzie panel dyskusyjny zatytułowany *Nauczanie ekonomii w szkołach – problemy i rozwiązania*. Konferencję zakończą warsztaty dla nauczycieli dotyczące zarządzania projektami.