Highlight: Technology that shapes a future of education

Education fit for the futures

Prof. Jim Dator, a Professor at the Hawaii Research Center for Futures Studies, stresses in this article that it is absolutely essential to determine first what the futures of society generally might be before deciding what the futures of education should be. Educators need to survey the literature supporting the profoundly different images of the futures before committing to any long-range plan and the policies facilitating it.

Technology-based assessment: Challenges and solutions

The OECD Programme for the International Assessment of Students’ Competencies (PISA) has substantially shaped education policies and practices across the world. While PISA in its beginnings was a paper & pencil assessment only, very early discussions showed already the need for a technology-based assessment (TBA). This article highlights three key obstacles of a technology-based assessment, and the solutions that had been developed over time and are continually been refined and improved.

News & Events

New Horizon Report 2014 identifies emerging technologies likely to have an impact on learning

This eleventh edition describes annual findings from the NMC Horizon Project, an ongoing research project designed to identify and describe emerging technologies likely to have an impact on learning, teaching, and creative inquiry in education.

Mobile Learning Week: A revolution for inclusive & better education

Mobile Learning Week (MLW) is the flagship UNESCO conference on mobile technologies and education. Held annually, this event assembles a diverse group of stakeholders to share how affordable and widespread mobile technologies can advance Education for All goals.

The 2014 WISE Prize - Call for nominations

The WISE Prize for Education, now in its fourth year, is the first global recognition of an individual or team for an outstanding contribution to education. The Prize recognizes an inspiring and visionary approach as well as a proven track record of achievement in education at any level and in any sector – public, private or voluntary.

UNESCO turns up the volume up on World Radio Day

13 February was World Radio Day — a day to celebrate radio as a medium; to improve international cooperation between broadcasters; and to encourage major networks and community radio alike to promote access to information, freedom of expression and gender equality over the airwaves.

Programmes & Projects

Aalto University’s art students learning how technology, economy, politics and culture intertwine through applications of 3D printed art
In Finland, students explored how artists can utilize the potential of 3D printing to realize their vision through an art installation by the artist collective Brussels Pulp, a scientific-artistic collective that currently examines how technology, economy, politics and culture intertwine through 3D modelling and printing.

**Resources**

**Data changes everything: Delivering on the promise of learning analytics in Higher Education**
This article gives an insightful overview on how data and learning analytics are changing the higher education landscape.

**Augmented Reality: A new way of augmented learning**
Augmented Reality is enabling learners to control their own learning, through the active interactions with the real and virtual environments. This article is examining how Augmented Reality can enhance education by providing rich contextual customized learning environments.

**Personal learning environments in smart cities: Current approaches and future scenarios**
With the increasing number of the global population living in densely populated and technologically advanced urban spaces, the notion of smart cities is gaining importance, especially in view of citizen engagement, learning and participation. In this paper, the authors discuss smart cities as spaces for constructing Personal Learning Environments.

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**Highlight:**

**Education fit for the futures**

*By Jim Dator, University of Hawaii at Manoa, Honolulu*

The purpose of education is unchanging and universal: to help learners live successfully according to the norms, requirements, and possibilities of the societies in which the learners will spend their lives.

While the purpose is unchanging and universal, societies change, sometimes very rapidly and drastically, and societies differ considerably from one another at any point in time. What might be a valuable skill or attitude at one time might become unnecessary or dysfunctional at a later time. Thus educational forms and substance change—or should change—in order to enable learners to be successful in new and changing societies. Indeed, ideally, educational institutions should guide and lead the changes of societies, but in fact seldom do.

The modern university might be an exception. In contrast to the traditional, largely religious-based, universities of the past, the modern university was specifically created in the first third of the 19th Century with one primary purpose: to help transform agricultural polities into
industrial nation-states by turning peasants into workers and soldiers, and nobles into managers and generals. For over one hundred years, the future was clear for every nation, and for all modern parts of every nation, especially education, almost everywhere in the world: to “progress” and “develop” in order to promote, obtain, and perpetuate continued economic growth. All other purposes of universities—including the promise of upward mobility of graduates—were either subordinate to or part of that overarching goal of enabling faculty and graduates to acquire the attitudes, learn the skills, and invent and diffuse the technologies necessary to obtain and sustain the continued economic growth of their nation.

Since the early 1960s and 70s, as some nations were shifting from being “industrial societies” towards being “information societies” (ICT of course plays a huge role in that change), universities (and all national educational programs) have struggled to deal with the differences and indeed conflicts between education suitable for one or the other. Few if any universities have fully transitioned to focusing on the skills and ideas necessary for information societies, and of course in many parts of the world nations have not yet fully made the transition to industrialism, such less to informationalism.

Nonetheless, a survey of the long-range plans and policies of many universities in many parts of the world made it clear that almost none of them envision any other future for themselves and their graduates than continued (or renewed) economic growth.

And yet it is also clear to me from my experience for over forty years as Director of the Hawaii Research Center for Futures Studies within the Department of Political Science of the University of Hawaii at Manoa, in Honolulu, Hawaii, that continued economic growth is only one possible future of the world and all parts of it. It is not even “the most likely” future. Rather, it is one among several “alternative futures.” Educators need to survey the literature supporting the profoundly different images of the futures before committing to any long-range plan and the policies facilitating it.

It is absolutely essential to determine first what the futures of society generally might be before deciding what the futures of education should be. Few if any educational institutions do this.

While the number of competing images of the future is vast, our research has shown that each image is a specific example of one of four, “generic” images of the future. We label the four Grow, Collapse, Discipline, and Transform.

Grow is the widespread, nearly official view of global continued economic growth, mentioned above.

But more and more people are worried about the viability of such a future. Many very serious and plausible arguments are being made that the 200+ years era of continued economic growth is over. Energy, environmental, economic, and governmental insufficiencies or failures may be
pulling it down. While many people bemoan (or deny) this possibility, others affirm and even welcome it.

Largely in hopes of forestalling collapse, there have been many calls in recent decades for sustainability, self-sufficiency, and harmony. We label that image of the future “Discipline”—the belief that nations and communities need to stop the mad and unsustainable pursuit of mindless growth, and return to or create values and institutions that allow us to live lives of meaning and contentment based on personal and local self-reliance, environmental and social sustainability, and an overall sense of “enoughness”, instead of reeling from endless innovation and precarious change.

Others—though their numbers are few, their arguments are powerful—give evidence that shows that indeed continued economic growth is over, that collapse is avoidable, and that discipline, as defined, unnecessary. Rather, accelerating and merging electronic, biological, nano- and space-based technologies, among others--are pushing all societies into a world as novel, unpredictable, and surprising as is the transformation of a caterpillar into a butterfly for those who have never seen or heard of that metamorphosis. Humans seem to be creating their own artificially-intelligent successors, while environmental pressures on Earth as well the new environments of Mars and elsewhere will mold new species out of old homosapiens, sapiens as the Holocene Epoch morphs more fully into the Anthropocene Epoch.

From our years of work in futures studies we firmly believe that “futures of education” should never be undertaken until the alternative futures of the societies in which future graduates will live have been identified. Then, after a careful consideration and evaluation of the full array of alternatives has been made, plans, policies, and actions that will make educational institutions robust over ALL futures (rather than only one, mistakenly assumed to be “the most likely”) should be undertaken.

For more information on this process please see:


Further information:

- Hawaii Research Center for Futures Studies

Related links:

- R-learning = improved learning results?
- Mobile learning: “We cannot continue to live in the pre-digital era”
- SimAULA: Training our teachers through innovative methodologies based in serious games
- Learning is fun: Play to learn with game-based learning
- 2011 Horizon report on emerging technologies

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Technology-based assessment: Challenges and solutions

By Jean-Paul Reeff & Heiko Rölke, German Institute for International Educational Research (DIPF)
The OECD Programme for the International Assessment of Students’ Competencies (PISA) (http://www.oecd.org/pisa/) has substantially shaped education policies and practices across the world. While PISA in its beginnings was a paper & pencil assessment only, very early discussions showed already the need for a computer-based - or in a more general sense - a technology-based assessment (TBA). However, the implementation of a technology-based assessment in a large-scale international study faced several serious obstacles. These obstacles become more substantial when trying to translate the expertise and the technology to the context of daily educational practice (Reeff, 2007).

This short article highlights three key obstacles, and the solutions that had been developed over time and are continually been refined and improved.

Firstly, there was no single delivery platform for educational assessments that would have fitted all relevant needs in the beginnings of PISA. Developing and maintaining such a platform proves to be a complex and costly endeavor, hard to finance within a study like PISA, and certainly beyond the budgets of single schools. Early R&D efforts in Luxembourg (http://en.wikipedia.org/wiki/Tao_platform) yielded a prototype of an open-source platform (TAO), and that was later considered as a possible candidate to be used in large-scale assessments (LSA). A substantial investment of the German government into both the platform and related TBA activities speeded up its development and enabled its use in PISA 2009 for the Electronic Reading Assessment. Through further PISA cycles and its use in other studies (e.g. PIAAC) TAO developed into a mature platform to be used both in large-scale surveys and school-based assessments (www.tao.lu).

Secondly, there was little or no opportunity for user to develop authentic assessment items. While TAO encompasses all relevant facets of an entire assessment workflow (e.g. http://www.tao.lu/resources/tutorials/tao-platform-screenshots), it offers very limited scope or assistance with regard to item authoring capacities. In order to overcome these shortcomings the TBA group at the German Institute for International for Educational Research (http://www.dipf.de/en/research/research-themes/technology-based-assessment?set_language=en) developed a first prototype of an authoring system (ItemBuilder, http://tba.dipf.de/en/software/software/cba-itembuilder/cba-itembuilder-1) that facilitated the implementation of the PISA 2009 ERA items, both in terms of item development and the interface and integration with TAO platform. The fundamental idea of the ItemBuilder is to provide an easy-to-use authoring tool to enable test developers, teachers and other professionals developing computer-based items in WYSIWYG-manner without the help of programmers. Todays’ classes of items “include, but are not limited to: web environment simulations (including browser, search engines etc.), desktop application(s) simulation, complex problem solving items, and automata simulation (e.g. ticket automata, ATMs)” (Rölke, 2013) and, as an ongoing development, audio and video recording. The tool is free of charge for non-commercial projects; a more general open-access/open-source license is currently under discussion.
Finally, and above all in an LSA context, specific attention needs to be given to translation and adaptation issues. In studies like PISA and PIAAC, items are developed in English, but then have to be translated/adapted into one or more national languages in the countries participating in the study. In complex multi-media assessments, this task requires even more resources than in a paper-and-pencil environment. Teachers who want to implement a technology-based classroom assessment and use existing items from other countries may face similar problems. In order to facilitate translation and adaptation processes, DIPF, in close cooperation with cApStAn (www.capstan.be), developed a specific workflow as well as supporting tools to fit into the TAO-ItemBuilder working model (Upsing et al., 2011).

Summary
In response to the need in international large-scale assessments, concepts and tools for complex multi-media-type assessments have been developed, continuously improved and validated in multiple national and international studies. The tools are open-source and/or free of charge for non-commercial educational and research purposes, and tangible for use in school and classroom settings outside the international studies.

References:

Authors
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Heiko Rölke is the head of the Technology Based Assessment (TBA) group at DIPF, where he works as a senior software architect and manages several national and international assessment
projects. In recent years, Heiko Rölke has designed and developed important parts of the computer-based item development and delivery for PISA 2009, PIAAC, and PISA 2012, amongst several smaller-scale studies. rölke@dipf.de

Further information:

- German Institute for International Educational Research (DIPF)

Related links:

- R-learning = improved learning results?
- Mobile learning: “We cannot continue to live in the pre-digital era”
- SimAULA: Training our teachers through innovative methodologies based in serious games
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News & Events

New Horizon Report 2014 identifies emerging technologies likely to have an impact on learning

The NMC and EDUCAUSE Learning Initiative (ELI) jointly released the NMC Horizon Report > 2014 Higher Education Edition at a special session at the ELI Annual Meeting 2014. This eleventh edition describes annual findings from the NMC Horizon Project, an ongoing research project designed to identify and describe emerging technologies likely to have an impact on learning, teaching, and creative inquiry in education. Six key trends, six significant challenges, and six emerging technologies are identified across three adoption horizons over the next one to five years, giving campus leaders and practitioners a valuable guide for strategic technology planning. The format of the report is new this year, providing these leaders with more in-depth insight into how the trends and challenges are accelerating and impeding the adoption of educational technology, along with their implications for policy, leadership and practice.
“Campus leaders and practitioners across the world use the report as a springboard for discussion around important trends and challenges,” says Larry Johnson, Chief Executive Officer of the NMC. “Understanding how to better incorporate online learning in face-to-face settings will be critical over the next year, along with the notion that higher education institutions need to define policies around social media use to maximize the potential of these platforms for teaching and learning.”

**Key Trends Accelerating Higher Education Technology Adoption**

This year’s NMC Horizon Report identifies the Integration of Online, Hybrid, and Collaborative Learning and the Growing Ubiquity of Social Media as fast trends driving changes in higher education over the next one to two years. The Shift from Students as Consumers to Students as Creators and the Rise of Data-Driven Learning and Assessment are mid-range trends expected to accelerate technology use in the next three to five years; and Agile Approaches to Change and the Evolution of Online Learning are long-range trends, positioned at more than five years away.

**Significant Challenges Impeding Higher Education Technology Adoption**

A number of challenges are acknowledged for presenting barriers to the mainstream use of technology in higher education. Low Digital Fluency of Faculty and Relative Lack of Rewards for Teaching are perceived as solvable challenges — those which we both understand and know how to solve. Competition from New Models of Education and Scaling Teaching Innovations are considered difficult challenges, which are defined as well understood but with solutions that are elusive. Described as wicked challenges are Expanding Access and Keeping Education Relevant, which are complex to define, much less address.

**Important Developments in Educational Technology for Higher Education**

Additionally, the report identifies Flipped Classroom and Learning Analytics as technologies expected to enter mainstream use in the first horizon of one year or less. 3D Printing and Games and Gamification are seen in the second horizon of two to three years; Quantified Self and Virtual Assistants are seen emerging in the third horizon of four to five years.

The subject matter in this report was identified through a qualitative research process designed and conducted by the NMC that engages an international body of experts in education, technology, business, and other fields around a set of research questions designed to surface significant trends and challenges and to identify emerging technologies with a strong likelihood of adoption in higher education. The NMC Horizon Report > 2014 Higher Education Edition details the areas in which these experts were in strong agreement.

“With its 2014 edition, the Horizon Report for higher education has taken some important evolutionary steps,” says ELI Director Malcolm Brown. “The report now embeds the six technologies more explicitly in the overall context of higher education, with its expanded section on trends and challenges. The report has always assisted the community in making
decisions about technology directions, but now the trends and challenges sections provide additional resources for campus discussions and decision making.”

The NMC Horizon Report > 2014 Higher Education Edition is available online, free of charge, and is released under a Creative Commons license to facilitate its widespread use, easy duplication, and broad distribution.

Further information:

- NMC Horizon Report > 2014 Higher Education Edition

Related links:


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Mobile Learning Week: A revolution for inclusive & better education

How do we make educational materials accessible to a girl from a poor family in Africa where over 50% of her female peers will never go to school? How can we get books into the hands of the poorest people on Earth?

The answer, at least in the immediate term, is mobile devices – and more precisely, mobile phones. Mobile devices are the most successful and ubiquitous information and communication technology in human history. They are plentiful in places where books and schools are scarce.

In less than a decade, mobile technology has spread to the furthest corners of the planet. Of the estimated 7 billion people on Earth, 6 billion now have access to a working mobile phone. Africa, which had a mobile penetration rate of just 5% in the 1990s, is now the second largest and fastest growing mobile phone market in the world, with a penetration rate of over 60% and climbing.
Mobile devices are transforming the way we communicate, live and learn. We must ensure that this digital revolution becomes a revolution in education, promoting inclusive and better learning everywhere.

From 17 to 21 February 2014, the UNESCO Mobile Learning Week explored how mobile technologies can meet the needs of educators and help them improve their effectiveness. Under the theme of “Empowering teachers with technology”, MLW 2014 was considering the benefits as well as challenges associated with mobile learning—such as ensuring equity of devices, online safety, limited mobile-friendly content and the need for teacher training. “Technology can be a powerful education multiplier, but we must know how to use it... On its own, technology is not enough. Empowerment comes from skills and opportunities to use them. It comes from quality content that is inclusive, that draws on local languages and knowledge systems,” said UNESCO Director-General, Irina Bokova.

As mobile technology jumps from the margins of education to the mainstream, teachers will be key to the success of ICTs in teaching and learning. While not a panacea, mobile technology has a clear track record of improving educational efficiency. MLW 2014 investigated how educators can best utilize mobile devices to achieve national and international learning objectives, including Education for All.

Despite impressive progress, the world is not on track to achieving the Millennium Development Goals by the 2015 deadline. To ensure universal primary education UNESCO estimates that 6.8 million teachers need to be hired worldwide by 2015: 1.7 million are needed to fill new posts and 5.1 million are needed to replace outgoing teachers. These shortages—both current and anticipated—impede a wide range of development efforts by preventing young people from gaining access to the high quality instruction needed to excel in knowledge-based societies. The shortage of trained and motivated teachers is most acute in parts of the world where more and better quality instruction is desperately needed. In light of the urgency of the global teacher crisis, UNESCO wants to better understand how mobile technology can help prepare new teachers and provide professional development to working teachers.

Compounding the challenges of teacher supply, are concerns about teacher quality. Many children who are in school fail to develop basic competencies. As the latest UNESCO Global Monitoring Report reveals, 250 million students worldwide cannot read, write or count, even after four years of school. Close to 775 million adults – 64% of whom are women – still lack reading and writing skills, with the lowest rates in Sub-Saharan Africa and South and West Asia.

Improving educational access and quality requires political leadership, planning and action. To this effect, MLW 2014 hosted a policy forum, symposium, research track, 11 half-day workshops, and 80 breakout presentations on the most cutting-edge topics, such as Open Educational Resources; classroom apps for smartphones and basic phones alike, content for
tablets and netbooks; mobile learning pedagogics; building mobile learning apps; social media and more.

Mobile technologies hold the key to turning today’s digital divide into digital dividends, bringing equitable and quality education for all.

Further information:

- Mobile Learning Week: A revolution for inclusive & better education

Related links:

- UNESCO Mobile Learning Week
- Mobile learning: “We cannot continue to live in the pre-digital era”
- Learning with mobile technologies
- New publication: Mobile learning and policies: Key issues to consider

Previous issues of the e-newsletter:

- UNESCO "ICT in Education" Announcement e-newsletter

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The 2014 WISE Prize - Call for nominations

The WISE Prize for Education, now in its fourth year, is the first global recognition of an individual or team for an outstanding contribution to education. The Prize is enhancing the status of education by giving it similar prestige to other areas for which international prizes already exist, such as literature, peace and economics.

The WISE Prize for Education recognizes an inspiring and visionary approach as well as a proven track record of achievement in education at any level and in any sector – public, private or voluntary.

The global call for nominations is open until March 31, 2014 before 11:59 PM, GMT

Who can be nominated?

The WISE Prize recognizes an individual or a team of up to six people for an outstanding contribution to education. The achievements of the nominated individual or team should have
had a significant and lasting impact upon education at any level and should demonstrate an inspiring and visionary approach.

**Who can nominate?**

WISE welcomes nominations by individuals or institutions - including schools, international organizations and private companies - from anywhere in the world.

**Selection Process**

Nominations will be screened by a 12-person Committee which will make a pre-selection of no more than 15 candidates, whose identities will not be made public. An international Jury of distinguished individuals will then consider these nominees and select the Laureate who will be announced at the 2014 Summit to be held on November 4-6, 2014 in Doha, Qatar.

**Further information:**

- [The 2014 WISE Prize - Call for nominations](#)

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**UNESCO turns up the volume up on World Radio Day – 13 February 2014**

Radio is unique in its ability to reach the widest audience of any form of mass media; however, around one billion people still do not have access to this powerful tool. To address this disparity and help promote radio across cultures and communities, UNESCO created World Radio Day, now in its third year. The day chosen to mark the occasion, 13 February, is significant in that it was on this day in 1946 that United Nations Radio was created.

Radio is particularly well suited to reaching remote areas, as well as vulnerable populations including youth, women, the poor, the disabled and the illiterate. In addition to reaching these populations, radio also plays an important role in emergency communication and disaster
 relief. By celebrating World Radio Day, UNESCO hopes to educate the public about this important medium and improve international cooperation between broadcasters. In keeping with UNESCO’s goal of promoting freedom of expression, 13 February was also a day on which both major networks and community radio stations could focus their efforts advocate for access to information, freedom of expression and gender equality in media.

Gender equality was a sub-theme for this year’s World Radio Day, with goals of sensitizing radio station owners, executives, journalists and governments to develop gender-related policies and strategies for radio; eliminating stereotypes and promoting multidimensional portrayal in radio; building radio skills for youth radio production, with a focus on girls as producers, hosts, reporters; and promoting the safety of women radio journalists. Encouraging and promoting the participation of women in radio not only helps bridge the gender divide and work toward gender equal media, but it also empowers women to take on major roles in their communities and express themselves freely. In this way, radio becomes more than just a conduit for delivering news and entertainment – it plays a powerful role in the development of individuals within communities.

Since the first World Radio Day in 2012, the Asia-Pacific region has seen many successful projects marking this day. In 2013, Radio the Voice of Viet Nam broadcast a special program with the theme “Modern radio broadcasting in the multimedia era,” and also took part in a 25-country initiative on the website www.wrd2013.com, where people could share their passion for radio through messages that were then broadcast through the station. The same year, the Cambodian Centre for Independent Media collaborated with UNESCO’s Phnom Penh office to produce a phone-in radio show in Ratanakkiri province, aimed at promoting the exchange of views and drawing upon a wealth of local knowledge in an area where government-controlled media often means diminished freedom of expression.

For more information on World Radio Day, including resources, audio materials and other helpful information, please visit www.unesco.org/new/en/world-radio-day

Further information:

- UNESCO turns up the volume up on World Radio Day – 13 February 2014

Related links:

- UNESCO Bangkok and EAZY FM 105.5 'Tune into Love' on World Radio Day!
- Mobile App Tunes in to Riches of Community Radio
- Low-cost audio computer helps NGO in its development work
- Interactive radio instruction – How cost effective ICT can have a remarkable impact
- Afghan LIFE website
- Emerging technologies in distance education
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Programmes & Projects

Aalto University’s art students learning how technology, economy, politics and culture intertwine through applications of 3D printed art

Often when we think of technology for education, we usually associate it with innovative gadgets, tools, or equipment that students and teachers use in science, engineering, and math classes. Not many people may relate it with the arts, as they seem to be two different worlds.

The word ‘technology’ seems to have connotations of being science-oriented, programmed, mechanical, and robotic while the word ‘art’ gives impressions of life, freedom, movement, and emotion. How could these two possibly overlap? In fact, technology has been the arts’ best friend for quite a while, allowing artists to go “digital” in this modern 21st century. Examples of products of such combination are sketch/drawing software, computer graphic design suites, photo editors, digital cameras, sound engineering systems, and etc. Technology makes artists’ lives easier. Technology creates a new kind of art. Technology empowers artists to take their imagination further and achieve the possibilities that were previously hindered by the lack of scientific know-how or extremely high costs.

Not only are artists enjoying the benefits of the blend of art and technology, but educators are also incorporating them into teaching and learning. How is technology supporting the arts educationally? Let’s explore a few interesting projects by art students at Aalto University in Finland as they are experimenting with 3D printing technology in their projects to bring out another dimension of art to life!

3D printing or additive manufacturing is a prototyping process where a real physical object is created from a 3D computer design. A 3D printer takes different materials, from biodegradable plastic filament PLA to ABS plastic to Nylon, melts it into thin layers onto a surface, moves up, and prints another layer on top until it forms a shape as designed.

This technology that has been around in the engineering, architecture, and manufacturing industries since the late 1980s, but it was not until early 2010s when it began to gain the public’s interest, and its application has gone wider to many other fields including automotive, medical,
education, and fine art, as the technology has improved and become more affordable for consumer use. [1], [2], [3]

In collaboration with the Aalto University Digital Design Laboratory (ADD) and the Aalto University’s Department of Art, students explored how artists can utilize the potential of 3D printing to realize their vision through an art installation by the artist collective Brussels Pulp, a scientific-artistic collective that currently examines how technology, economy, politics and culture intertwine through 3D modelling and printing. Students sourced multiple images of the European Commissioner for Economic and Monetary Affairs and the Euro, and generated 3D scans of his figure, which would then be used to produce gypsum 3D models of the commissioner in multiple positions and gestures that represent his character.

The work consists of three 30cm high digital sculptures of the EU Commissioner for Economic and Monetary Affairs and the Euro in three different poses. The work was installed in an old growth forest as a part of the Mustarinda 2013 exhibition in Hyrynsalmi, Finland. ADD provided technological expertise and facilities for planning and executing the work. The “3D printing as an artistic medium” art course was also included to master level students, introducing them to the history and use of 3D printing in art, as well as teaching the basics of polygon modelling and exporting models for 3D printing.

On the other hand, Convolute Project is ADD’s case study of the design-to-consumer business model, executed through the design of a lamp that allows ample variation to lead to insightful comparisons. The first phase of the project was a technical study exploring the paradigms of two 3D printing machines with their own identities. Over 20 different iterations were designed and printed using a catalogue of polymers with each lamp having its own characteristics. The goal was to produce a high-designed, aesthetically dynamic, one-off product. A lamp was chosen to allow enough variation for interesting comparisons. [4], [5]

Besides its great utilization in fine arts, 3D printing technology offers several benefits for education. First of all, it provides teachers with three-dimensional visual aids that they can use in their classroom, particularly in illustrating a hard to grasp concept. For example, in a geology class, students can learn about topography more accurately in identifying patterns and layers, using a 3D-printed object of a place or region on a map, which represents the surface features, their relative positions, and elevations. This concept may be hard to understand from looking at 2-dimensional illustrations alone.

Secondly, the 3D printed objects make it easier for teachers to get attention and interests of students, compared to simply showing them pictures of the objects. It is tangible and feels more real.

Thirdly, it enhances hands-on learning and learning by doing, especially in engineering, architecture, and art classes because it allows students to use this prototyping technology to create their own realistic 3D models of their designs. This makes it easier for architectural
students, for example, to examine their product prototypes, evaluate them on design and functionality, and make improvements.

Fourth, 3D printing provides more room for interactive class activities. In biology, for instance, teachers can create a 3D model of the human heart, stomach, skeletons, and etc. to teach students about the human body. Teachers in geology class may print a 3D object of a scanned rare fossils to show students in class, without risking damage to the originals. Also, by printing multiple models of the same design, they can be distributed to each student or group of students to allow a closer look of the specimen. [6], [7]

Lastly, 3D printing technology can aid students with visual impairment in their learning. For instance, Yahoo Japan Corporation developed a 3D printer that is easy to use with a voice command, in which students say the name of the object of choice, ranging from snowflakes to France’s Victory Gate, the Arch de Triomphe, and the printer will print out this 3D model. This allows students to hold and touch the object, expanding their imagination and understanding of the world. It works particularly well for things that are too big, too small, or too dangerous to handle in real life.

Several primary and secondary schools, as well as universities in the UK and the US are starting to use this 3D printing technology to enhance teaching and learning experience for teachers and students. There are many more innovative projects around the utilization of the technology in education being featured in news articles that may inspire us to develop something of our own. Perhaps, this revolutionary technology may forever transform the way we learn.

References:

Further information:
- 3D Printing as an Artistic Medium

Related links:
• R-learning = improved learning results?
• Mobile learning: “We cannot continue to live in the pre-digital era”
• SimAULA: Training our teachers through innovative methodologies based in serious games
• Learning is fun: Play to learn with game-based learning
• 2013 Higher Ed Edition is here! > The NMC Horizon Report > 2013 Higher Ed Edition is here!
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Resources

Data changes everything: Delivering on the promise of learning analytics in Higher Education

In recent years, low background rumblings have been heard in the land of education and training—rumblings that are getting louder each day. These are the sounds of the learning world discovering what Internet professionals working in other market sectors have known for years: The "digital breadcrumbs" that learners leave behind about their viewing, reading, engagement, and assessment behaviours, about their interests, and about their preferences provide massive amounts of data that can be mined to better personalize their learning experiences.¹

Using evidentiary methods and technology tools to figure out how to interpret what these digital breadcrumbs are telling us has come to be known in education circles as learning analytics. Learning analytics provide the tools, technologies, and platforms to empower educators to open the door on meaningful learning experiences that can engage, inspire, and prepare current and future students for success.

This article written by Ellen Wagner and Phil Ice gives an insightful overview on how data and learning analytics are changing the higher education landscape.

Read the full article:
Augmented Reality: A new way of augmented learning

Augmented Reality, a novel way of superimposing digital contents into the real context, is impacting the mobile communications industry by providing a radical shift in human-computer interaction. It has been foremost applied in the areas of entertainment, retail, travel, advertising, and social communication.

Augmented Reality has great potentials in education, and more excitingly, opens a novel realm for, and even redefines, eLearning. It offers an innovative learning space by merging digital learning materials into the format of media with tools or objects, which are direct parts of the physical space, therefore creating "situated learning."

Augmented Reality is well aligned with constructivist notions of education where learners control their own learning, through the active interactions with the real and virtual environments.

This article by Professor Xiangyu Wang is discussing how Augmented Reality can enhance education by providing rich contextual customized learning environments.

Read the full article:

- Augmented Reality: A new way of augmented learning

Related links:
Personal learning environments in smart cities: Current approaches and future scenarios

By Ilona Buchem, Beuth University of Applied Sciences Berlin, Germany and Mar Pérez-Sanagustín, Telematics Engineering Department, Universidad Carlos III de Madrid, Spain

With the increasing number of the global population living in densely populated and technologically advanced urban spaces, the notion of smart cities is gaining importance, especially in view of citizen engagement, learning and participation. We propose to consider smart cities as learning spaces and call for innovative pedagogical approaches for using technologies embedded in physical environments to support connected and ubiquitous learning in smart cities.

In this paper, we discuss smart cities as spaces for constructing Personal Learning Environments. Our special focus is on mobile and locative media, which open new possibilities of interaction with the surrounding environment. In technology-rich infrastructures such as smart cities, physical objects, including buildings, works of art or points of interest, can become part of the learning environment. When mediated through technologies, e.g. by means of mobile and locative media, the surrounding physical environment and the digital environment can be dynamically merged into augmented, ad-hoc Personal Learning Environments.

In this paper we give a short introduction to smart cities, smart citizens and smart city learning, and go on to outline some innovative applications of mobile and locative media in urban...
spaces, including open badges, smart glasses and mobile tagging, and discuss their potential for learning.

Followed by these examples, we discuss educaching as an approach to smart city learning and provide some practical examples based on the example of etiquetAR, a mobile, locative application that allows creating interactive tags to support augmented learning experiences. We then present the results of an international, explorative study on smart city learning, which we conducted with educators from Europe, North America, South America, Middle-East and Asia-Pacific. Based on the synopsis of current research and practice and the results of our study, we argue for an extended view of Personal Learning Environments which are not permanent, but created ad-hoc and adjusted dynamically by connecting virtual and physical spaces in smart cities.

Read the full paper:

- [Personal learning environments in smart cities: Current approaches and future scenarios](#)

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