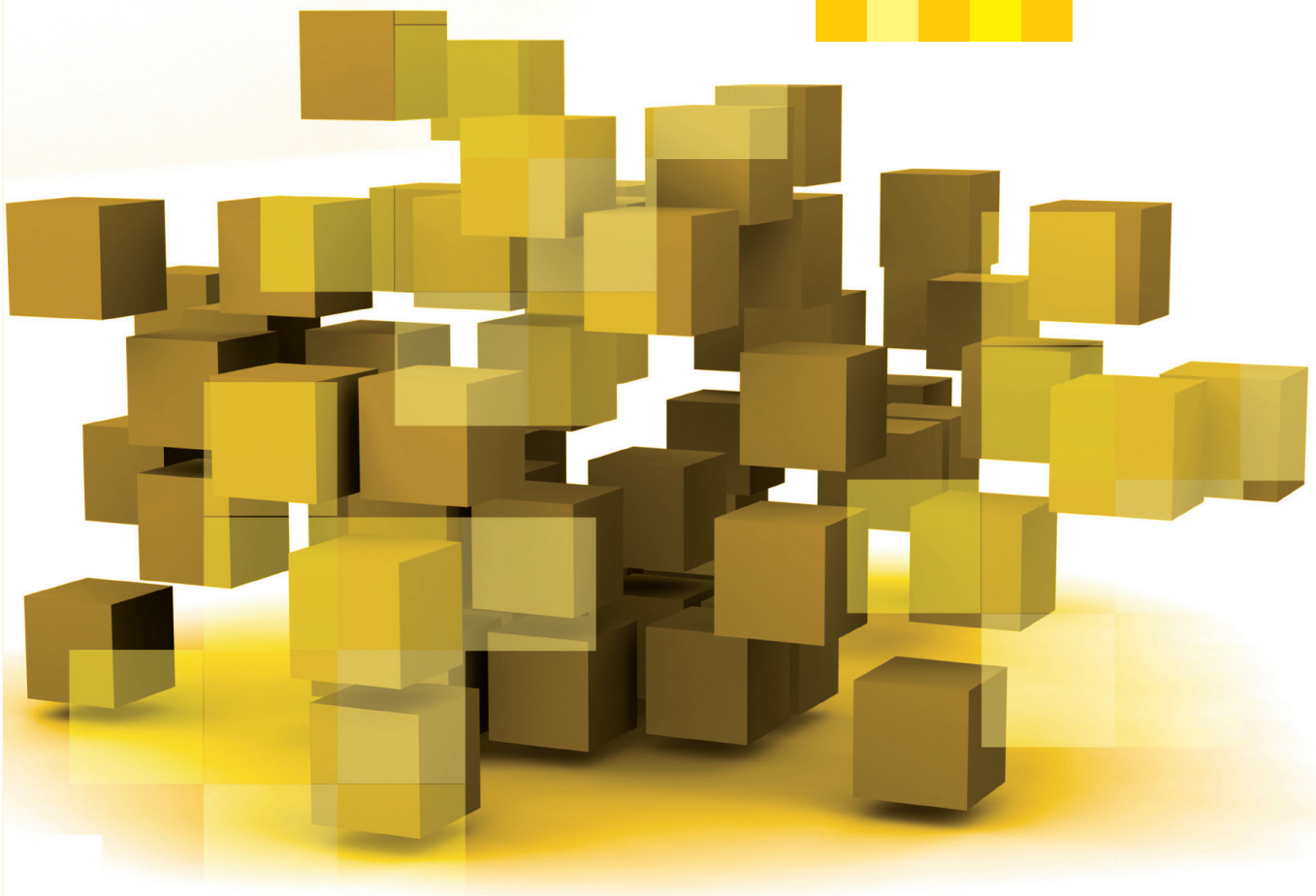
Higher Education in the Digital Age

Rise of the MOOCs

Les cahiers de veille de la Fondation Télécom



FONDATION TELECOM

Editorial

June 2014

Digital Technology has invested the field of higher education and training for several years introducing disruptive effects on teaching and opportunities for transformation and progress. The development of MOOCs reflects this transformation.

In this context, the Institut Mines-Telecom anticipates a significant change in higher education toward more horizontal and massive practices, made possible by open and online learning. With its digital practices, the Institute wants to assert its tradition of excellence in its training mission by being a leading player in the digital transformation underway. It has launched several initiatives aimed at creating shared and open training devices, undertaking scientific research actions in digital pedagogy and driving this transformation both in its schools and in connection with its ecosystem. Thus it is not surprising that two of the first three French MOOCs have emanated from the Institute.

As part of its "Ambition 2020" fundraising campaign, the *Fondation Télécom* supports a flagship project to accelerate the creation of new shared training devices, both online and open, including the production starting from 2015 of 10 new training massive open online devices per year, in line with the state of the art and beyond. The project is part of a more comprehensive framework in Telecom schools belonging to the Institute: developing learning by teaching open online communities to meet the changing expectations of students and to showcase the lessons to new audiences, as well as increase the efficiency of teaching.

Faithful to the principles that have made it successful, this publication entitled "Higher Education in the Digital Age, Rise of the MOOCs" aims to:

- provide a common culture;
- allow the widest possible dissemination in the corporate world;
- contact technical experts who are not specialist;
- provide new strategic opportunities by encouraging joint projects with research teams.

This works aims to shed light on the issue for the Institut Mines-Telecom by highlighting the creation of new digital training devices, in both directions: research will renew the potential for innovation in the educational activity. Conversely, devices that will be created will be an appropriate field for observation and experimentation.

I wish you a pleasant reading.

Guy Roussel
President of Fondation Télécom

Contents

What Method of Delivery for Education in the Digital Age?

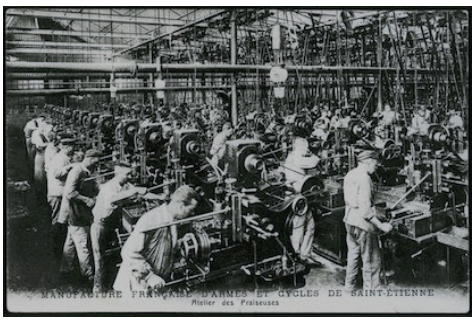
THERE MAY BE SOMETHING OUT OF DATE about our higher education. Whereas it should train youth who can find a job, the unemployment rate, with rare exceptions, is still very high. Judging by the emptiness of lectures halls, are students no longer interested in their studies? Is it the fault of teachers who are no longer able to share their knowledge? In fact, just as music, books and media have been disrupted by technology and market forces, so has higher education and it takes time to adapt.

Over the past 10 years technology has triggered radical changes in the way we produce and distribute music, books and news, and it is now the turn for knowledge acquisition as well. Massive open online courses now offer training to thousands of students at once, who can work at their own pace, use all the complementary knowledge they find on the Internet, and are invited to discuss in forums with students from all cultural backgrounds. The classroom is no longer a place where they learn, but the place where they can be guided by tutors face-to-face with all the training they have done outside the institutions.

Indeed, education is now at a turning point and this is going to occur rapidly at a global scale and massive courses are just the beginning. Education will soon be everywhere, at every moment, through our mobile devices driven by algorithms which know what you know and determine what knowledge content is the next step for you. Degrees may no longer be necessary as social recognition via gamified badges could be the norm. There are numerous breakthroughs awaiting higher education, and this is an exciting time for those who want to experiment with the future of education –provided we know from where we came.

A Brief History of Higher Education

Starting January 27, 2014, more than 18,000 participants from all over the world followed through a six weeks Duke University course named *"The History and Future of (Mostly) Higher Education"*, subtitled *"How We Can Unlearn Our Old Patterns and Relearn for a Happier, More Productive, Ethical, and Socially-Engaged Future"*, on the Coursera platform. This initiative was coordinated by Professor Cathy N. Davidson, co-founder of the Humanities, Arts, Science and Technology Alliance and Collaboratory (HASTAC). The second week of the course was a lecture called *"How do we get here, a brief history of Higher education"* that explained where North American Universities came from as we know them today. This history is worth mentioning as the first ***Massive Open Online Courses*** (MOOC) making the headlines came from Stanford in 2011, and MOOCs underlying techniques are now spreading the world. Following is an excerpt from the course:



Why were peope willing to work this way?

"From Socrates to Descartes and up to our present time, there were always people uncomfortable with change and new technology. Socrates objected thus to writing. He worried that reliance on writing would erode the students' memory, and furthermore that reading would next mislead them to think that they had earned knowledge, when they had only accumulated data. As for René Descartes (1596-1650), the famous author of *"Cogito ergo sum"*, the concept that the thought process define the self, therefore meant that the idea of books clouded the mind. For him the best kind of learning was quiet, introspective, thoughtful learning where you reflected upon the assumptions behind your convictions.

The primary focus of Harvard College, the first North American university, in 1636 was to train young men for the ministry. It was a very select group of people who were typically children from the upper middle class, if not the richest Americans. The second university of the time was the College of William and Mary, established in 1693, and like Harvard, it focused on what was then called ***liberal arts***, which is different from what is known today as liberal arts. The typical subjects in the liberal arts in the late 17th century were Greek and Latin, geometry, logic, rhetoric, ethics, and ancient history. They were considered as liberal arts in the sense that they trained the mind which helped to create *an adequate filter* to understand the world and act upon it, but these subjects also provided a cer-

tain rigor. The typical method in Harvard, and the college of William and Mary was *repetition*. Students repeated things over and over until they were learned. Memorization and recitation were at the heart of this education.

Next, in the 18th century came Diderot (1713-1784) who systematized during his 20 years of hard work on his ***Encyclopedie*** the way we think about the sciences, arts and crafts into categories, or what are now referred to as disciplines. From this was born the French education system that is much more disciplinary, hierarchical, and highly focused on what is required in order to attain the degrees from the most prestigious universities. However, the ideas from this Age of Enlightenment in Europe had an impact worldwide.

The Humboldtian University Age

Probably the biggest contrast in the 19th century education was between the French and the German systems. The German system was looking to being modern and new. It took some of the ideas from Kant about what are the filters that allow us to see the world, and developed these filters in a more research oriented, innovative and productive way. The modern university of the 19th century is often referred to as the ***Humboldtian university***, named after Wilhelm Von Humboldt (1767-1835), a German educator who based his work on the ideas of Friedrich Schleiermacher, a German philosopher who emphasized the importance not of memorization, recitation and repeating authorized knowledge but of producing new knowledge. This was in opposition to the French ideas about the importance of certification, degrees, the conformity of views, reputation, and ranking, and the hierarchy of elite education. He and the University of Berlin, the first Humboldtian university, dropped the recitations and instead relied on labs and seminars. They maintained the idea that the student in higher education should be a researcher under the tutelage of a professor.

The Humboldtian university was designed to create the most productive and innovative thinkers and to encourage experimentation and exploration. It is at the origins of the research university and the education system that we have inherited from today.

British education combined elements of the French and German systems, and when education came to the colonies in the United States, it became an amalgam of these educational systems. Thus, later in the 18th and during the 19th centuries, the emphasis started to change from recitation and repetition in the United States to a somewhat more Humboldtian model of individual research and writing.

During the 19th century, education mostly prepared people to the Industrial age. According to Cathy N. Davidson, following are essential keywords of education in the U.S. Industrial age:

- **Timeliness:** much of 19th century American education focused on being on time and completing things in a timely manner.
- **Hierarchy:** this is a carry-over from the older system and the French system, where importance was placed on the status of the headmaster or professor.
- **Productivity:** this is from the Humboldtian university. Not just creating knowledge, but also its quantity, as well as how quickly and effectively it can be produced.
- **Standardization:** the 19th century becomes more and more interested in this standardized form of education, which one might say comes from the French system.
- **Scientific methods and metrics:** using methods from industry and science to assess productivity, as well as when assessing intellectual knowledge or new knowledge that has been produced in higher education.
- **"Two cultures" or (De)value system:** the separation of scientific, mathematical and technological knowledge from interpretive, creative, artistic, historical knowledge. For the first time, math is no longer part of the liberal arts, but is part of science and is somehow separated from rhetoric.
- **Teaching – not learning, but teaching:** education was top-down; knowledge to be communicated to others.

The ancient classroom, and most of today's classrooms, were spatially organized for preparing pupils to work in the factory. This factory model of education is no longer viable for the 21st century.

The Age of Knowledge

A Collective and Contributive Production

With the Internet comes, at least potentially, a democratization of the access to knowledge: encyclopedias, dictionaries, public or private digital libraries, areas of digital or digitized books and articles, archives of articles and Web productions (blogs, social networks, websites), places of exchange and capitalization of knowledge (forums, FAQs, etc.) are just a click away. The Web has become a living archive: 23 million Wikipedia articles in over 300 languages, updated continuously, 20 million digitized books on Google Books, and millions of new information published daily. Search engines and social networks allow one to find, report and share content. The digital revolution profoundly affects access to knowledge opportunities. This explosion of content is made possible through the contribution of an ever growing number of knowledge producers. Thus, writing encyclopedia articles is no longer restricted to experts, nor the publication of press articles or movie reviews. Knowledge production has become cooperative and participatory, and even in the scientific domain open science is paving the way to a contributions-based process.

Certainly, the logic of participation is not unlimited and universally distributed. There is great diversity in the form of engagement with over 90% of users who are mere consumers, 5% commenting, evaluating or sharing, and 2% that actually produce content. However, user input is not limited to the *production* of knowledge, it is also about digitization, availability, sharing, curation and promotion. Overall, professional productions are being enriched by amateur productions. If this participation remains marginal, it is still reconfiguring the landscape.

Facing an Abundance of Knowledge

Some issues are raised related to the immediacy of access to knowledge. What are the consequences of the transition from scarcity to abundance in the field of information? There is a growing discrepancy between the amount of information produced and the ability to sort, prioritize, and understand –in other words to reappropriate. These situations can best be described by terms such as information overload or cognitive overload. Added to this is the debate on the relative effectiveness of multi-tasking compared to operating modes where tasks are broken down and processed sequentially. Indeed, studies suggest that humans would be more effective in treating the tasks one after another instead of interlacing, but in an environment of mutual dependence, meeting the demands of others and allowing oneself to be interrupted unlocks the

Training throughout life

The accelerated pace of innovation and that of technological, economic and social changes quickly makes knowledge obsolete and leads to a rapid reconfiguration of business. Our professional careers are changing; spending an entire career in the same company is a situation that will soon be exceptional. Career changes and mobility will be the common lot of workers who become entrepreneurs in their career, as seen in most cases for artists. Training, and in particular self-training, throughout life is essential to maintain one's employability. This will be less restricted to childhood and youth years, and become a process of continuous education. As this training is essentially self-led, one can imagine how valuable it is *"à la carte"*, where one learns by choosing one's own modules and learn at one's own pace. Teaching will soon be recomposed via customizable modules, along with tutoring within cohorts of learners.

Another aspect to consider is that a given training will no longer be restricted to an age group, but several age groups simultaneously resulting in the training of a new generation. Initiatives such as simplon.co or Codeacademy offer both children and all willing adults to learn how to code, and this new knowledge, one of the 21st century literacies, could be disseminated among us in a few years rather than a few decades.

"42" is a private French institution where it is possible to learn computing without diploma requirements. The building is equipped with a lecture-hall which accomodates roughly 100 students, the remaining students following masterclasses via videos in spatially organized rooms for peer-to-peer teaching.

Emergence of New Literacies

Is Google making us stupid?
Nicholas Carr, July 1, 2008
http://goo.gl/AYKRk

work of others. Some emphasize the dangers of these situations that makes urgent prevail over important, superficiality over depth, and cause the individual to sometimes feel overwhelmed by these changes. However, showing the ability to multi-task and developing filters and prioritization aptitudes is proof that individuals are able to adapt to their new environment.

Another issue coming from an abundance of knowledge is the impact of outsourcing memory. Data and information is now out of our heads and stored in machines. We just need pointers to retrieve them. The empowerment of knowledge raises the question of deindividualization –would the individual, deprived of his or her knowledge, having deposited his or her knowledge at a distance become more alienated? From Nicholas Carr famous paper, numerous essays have been published. We would be facing chunks of fragmented, superficial knowledge with low storage capacity. However, other authors propose the contrary that the individual, freed from the constraints of storage, is able again to focus on his or her thought.

Finally, what if accessibility was generating a second order digital divide? In Western countries, the fracture related to access appears to be largely resolved with equipment and high-speed broadband networks. However, significant differences emerge between those who can navigate the Internet and can search, sort and analyze information, and those who use it as a tool of entertainment without exploration. New inequalities are deployed around the control of access to information tools.

It is necessary to ask ourselves the question, what is the purpose of education? Is it still to train people for their future job, or is it not rather to help them to adapt, to learn how to learn, unlearn and relearn? This raises the questions about the models for creating and transmitting knowledge through higher education. Are we going to follow the Humboldtian route or still be stuck in the passive view of knowledge transmission from the knowing teacher to the ignorant pupil? From the knowing supervisor to the ignorant employee?

A recent report from the Institute for the Future analyzes the key drivers that are reshaping the landscape of work and identifies the key words needed for the years to come:

1. **Sense-making**: the ability to determine the deeper meaning or significance of what is being expressed.

2. **Social intelligence**: the ability to connect to others in a deep and direct way, to sense and stimulate reactions and desired interactions.

Educational institutions

Alongside, the world changes and the school system is slowly evolving. Almost all studies agree that teaching has not changed for centuries and that the properties of the classroom are still the same: the space, dedicated time, the relationship between teacher and student, the discipline to teach, and an agreed upon relationship where the master is knowledgeable and the student is ignorant. The school has not changed much (in fact it has changed, but the dominant discourse tends to emphasize continuity rather than transformation), while the environment outside the school is undergoing profound changes. Indeed, the academic institution feels threatened by the Internet that is challenging the school in many aspects: the master-student hierarchy, the ranking system, the disciplinary divisions, the distinction between high and low culture, and the selection system.

Learners and students are living in deeply transformed environments. They experience immediate forms of access to knowledge that challenge the role of the teacher as a transmitter of knowledge, all the assertions of a teacher can be controlled and sourced by students. Facing the abundance of resources on the Web, the teacher is immediately placed in a network of evaluation and comparison that goes beyond the comparison between teachers of an institution. In addition, students find online a number of exceptional resources: lectures, exercises and assignments already completed without having to think.

> *The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.*
>
> *Alvin Toffler*

6 key drivers are reshaping the landscape of work:

extreme longevity •

rise of smart machines and systems •

computational world •

new media ecology •

superstructured organizations •

globally connected world •

http://goo.gl/fUquAk

3. **Novel and adaptive thinking**: proficiency at thinking and coming up with solutions and responses beyond that which is rote or rule-based.

4. **Cross-cultural competency**: the ability to operate in different cultural settings.

5. **Computational thinking**: the ability to translate vast amounts of data into abstract concepts and to understand data-based reasoning.

6. **New-media literacy**: the ability to critically assess and develop content that uses new media forms, and to leverage these media for persuasive communication.

7. **Transdisciplinarity**: literacy in, and ability to understand concepts across multiple disciplines.

8. **Design mindset**: the ability to represent and develop tasks and work processes for desired outcomes.

9. **Cognitive load management**: the ability to discriminate and filter information for importance, and to understand how to maximize cognitive functioning using a variety of tools and techniques.

10. **Virtual collaboration**: the ability to work productively, drive engagement, and demonstrate presence as a member of a virtual team.

Digital Humanities in the Classroom

For the future of the school, the question of the role of the Internet is ultimately secondary. In other words, the digital age has changed the ecosystem in which there are students, and has forced to rethink the educational system with the Internet being one component of this transformation.

Easier access to knowledge through digital means will force to move the balance in teaching and to focus on the learning process rather than on the transmission of knowledge. Developing second-level learning (learning to learn) will prevail over the acquisition of knowledge. Learning to navigate through masses of information becomes a central know-how to develop during training: searching, sorting, evaluating, criticizing, implementing. In this context, the humanities have their full place in training in the digital age where they are designed to awaken citizens. This is even more true as they are based on learning a reflexive process (reading, comparing, stepping back) that cannot be delegated to machines. When Edgar Morin identified seven necessary knowledge for the future education in 1999, it was also a humanist posture he adopted.

that evolve slowly

Some experiences of teachers showed that students would copy what they have found on the Web without exercising their critical judgment, without even rephrasing. Thus, the immediacy of access requires to rethink the type of homework and exercises that is given to do. The transformation of practices of younger generations heavily involved in a screen culture of navigation, zapping and multi-tasking, make obsolete the classical position of actively listening to the teacher. Students have difficulties remaining in a passive posture in front of the teacher. As it is increasingly difficult to focus young people, teachers tend to adjust their course formats accordingly by multiplying short sequences and by changing the pace.

From the teacher's point of view, there is a decline in authority as she or he is no longer the sole possessor of knowledge. There is some resistance to technology in the teaching profession partly due to the uncertainty of its usefulness and efficiency of acquiring skills, and secondly due to the paradoxical situation that makes teachers face students who are more competent, at least apparently, in the use of new technologies. As far as institutions are concerned, they are often caught in the political injunctions to develop digital offers, and to deploy digital tools without being convinced that this is a priority. Certainly there have been many experiments to introduce technology dedicated to education: investment in infrastructure, devices, tools and services, but it is clear that these experiments have had mixed results and technology is still far from the heart of the training activity. Many attempts do not extend beyond the experimental stage and they are often worn by teachers keen on new technologies. Even worse, young people may have their first contact to technology at school through teachers who doubt and lecture about the risks of the Internet. Thus, they will acquire either doubts about the competences of their schoolmaster or fears about their digital environment. We are therefore faced with a situation where the Internet has difficulty finding a legitimate place in the classroom, where it should be an ally rather than a competitor to the teaching profession.

Changes in Higher Education

By 2030, we can expect a school better articulated with the working world. There will be no more the one time studies followed by the time of work, but porous borders and closer links between education and employment through learning, internships, and continuing education. In this context, the school will establish a framework to develop the ability to work in teams (problem-based learning, projects etc.) and to develop creativity, and the ability to innovate, which are essential skills for working in current and future environments .

Finally, with these changes technology will naturally find its place in the classroom as a support to education, particularly in collective work .

Specificities of Higher Education

If primary and secondary school are local institutions under local competition, the situation of higher education is somehow different and subject to international competition.

Engaged with the logic of institutional rankings and branding value, each higher education institution is seeking to increase its scope of recruitment and online courses allow them to leave the physical boundaries of the institution and increase its visibility. If online courses have long existed, engineering online pedagogy is currently undergoing a transformation through MOOCs and shifts in higher education are anticipated.

Recent changes are arising in three areas: Producing the digital support of a course is not a simple video or audio recording of a classical course, but the invention of a new format that is a hybrid of language, images, graphics, video; Secondly, an online course is not just a broadcasted thing, it must be conceived with all the environment that promotes exchanges between students and tutors; Finally, these course modules include an evaluation system that allow the distribution of certificates.

We are witnessing the industrialization of distance learning which harvest all the potential of digital technology: new formats, animation of remote cohorts of students, and interactions between producers and consumers. Long established distance-learning institutions, such as the Open University in England, have taken this turn. Start-ups and spin-offs, often from higher education institutions or research labs, have been created (Coursera, Udacity, etc.).

The growing development of massive online courses affects the whole structure of lessons. Competition between lectures will therefore be international and we imagine that the existence of an excellent online course on a particular area will actually devalue traditional lectures developed in each institution. In other words, the lectures will be supported by a smaller population of teachers who will each have a much larger audience. The role of local teachers will evolve into tutors and facilitators whose central role is to verify and support the growing competencies, to guide learners to good online resources, and to organize the implementation of knowledge.

Further readings

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2. Paths for the Digital Change of Education

THE TEACHING PROFESSION will probably be deeply transformed with a strong differentiation between a small core of star teachers producing lectures to a large public and a mass of teachers whose role will no longer be the transmitters of knowledge, but guides in the learning process and act as tutors. This was foreseen in 1987 by Jacques Rancière in his book, *"The Ignorant Schoolmaster: Five Lessons in Intellectual Emancipation"*. From the work of the creator of the method of "intellectual emancipation", Joseph Jacotot (1770-1840), a French teacher and educational philosopher, Rancière imagines another form of teaching where the schoolmaster is no longer necessarily the one holding the knowledge and facing the ignorant student, but the one who accompanies the student's progress from what he or she already knows toward what he or she does not yet know.

In this difficult period of transition from the industrial age to a fully digital age, **new tools** are available that enable or facilitate **various forms of learning**.

Tools, Devices and Components

Devices in the classroom:

- connected screens and mobile display screens
- mobile devices that can provide interaction with teachers
- interactive whiteboards
- capture of lessons, including video content and presentations

The virtual or remote dimension:

- telepresence and video conferencing in order to involve experts from a distance
- video and audio streaming
- IPTV
- virtual classrooms
- technologies presence – instant messaging, etc.
- *virtual learning environments*
- social networking and web 2.0 tools
- *e-portfolio*
- tools for digital creation
- serious games (see page 11)
- cooperative computer human interface
- mobile and augmented reality devices (see page 26)
- eye tracking experiments

New Forms of Learning

What follows stands in the framework of e-learning that includes all forms of learning with technological means.

Blended learning refers to the learning process where a student learns both at a brick-and-mortar facility, as well as via online delivery. Other terms found in literature are: blended, hybrid, mixed, melted, technology-mediated instruction, or web-enhanced instruction. It can be grouped into several distinct models, and more are to come as experimentations and hybridization of models are developed:

- **Face-to-face driver:** face-to-face teachers deliver the entire course; online learning in a technology lab is available as a supplement.
- **Rotation model:** within a given course students rotate between learning online at their own pace to learning in a classroom with a face-to-face teacher who usually oversees the online work; *flipped classroom* is a form of rotation model.
- **Flex model:** an online platform delivers most of the curriculum; teachers provide on-site as-needed support through in-person tutoring sessions or small group sessions.
- **Self-blended model:** students choose to take one or more courses online to supplement their traditional school's curriculum. Online learning is always remote, which distinguishes it from the online-lab model, but traditional learning is in a brick-and-mortar school. This model of learning is popular among high school students.

- **Online lab:** an online platform delivers the entire course, but in a brick-and-mortar location; students can also take traditional courses.

- **Enriched virtual model:** students work remotely while the teacher delivers all curriculum through an online platform; face-to-face check-ins are optional.

- **Online driver:** an online platform and teacher delivers the entire course; students work remotely and face-to-face check-ins are either mandatory or optional.

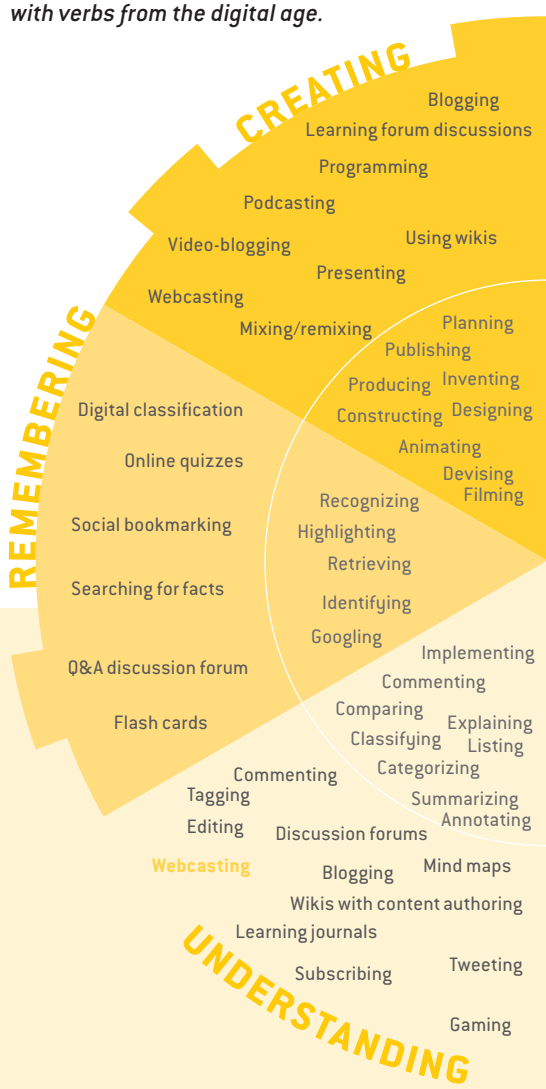
Other forms of learning emphasize the **synchronous** or **asynchronous** dimensions: does everyone take part of the course at the same time? If so, what differences does it make?

Next comes ***connected learning*** that defines learners as people interested in what they are learning, wishing to have peers and mentors sharing these interests, and directing their learning toward opportunity and recognition. Other flavors are ***networked learning*** that insists on the network dimension, and ***social learning*** which stands that social competence happens almost exclusively in a social group.

Situated learning is a model of learning in a ***community of practice*** that takes place in the same context in which it is applied. This leads to ***game based learning*** and ***cooperative learnings*** in an environment that promotes cooperation.

But above all, digital technologies open the path to ***adaptive learning***, which changes according to the student's needs.

Using Bloom taxonomy in blended learning. *The Bloom classification of learning objectives is a classical scheme within the educational community. It has been adapted here with verbs from the digital age.*



Videos

Video as forms of knowledge transmission

In the context of digital infrastructure open to innovation, the Internet is full of innovative experiments and teaching formats. All the potential of the Internet is used, such as hypertext resources and multimedia files: tutorials that are a hybrid of texts and commentary video screens and infographics; conferences in short format and recorded lectures widely disseminated. ***Ted Talks***, developed by Chris Anderson, are free diffusions of the best conferences on "Ideas worth spreading", which are new forms of knowledge dissemination. These are "performances" made by experts in short and lively formats. The use of video as a means of transmission of knowledge has exploded in recent years –expertise, lectures hybridizing speech, text, graphics and animated media become the norm for educational transmission. And finally, what Khan Academy has done is to acknowledge these changes by offering digital spaces of learning through play and video.

Video formats, too, are changing. It is now typical for videos proposed within MOOCs to be interrupted by in-video quizzes, or are synchronized with html content, maps or other components in the web page.

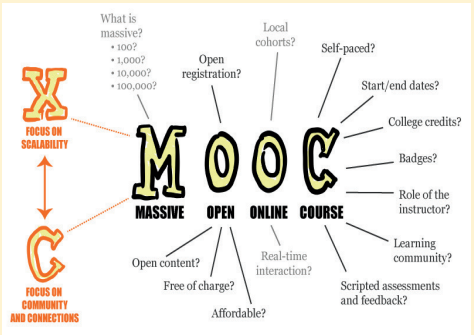
Video and student engagement

Videos are used to advertise MOOCs and they act as a trailer giving insights to the MOOC organization and the teachering team and staff. Promotional videos can be seen outside of the MOOC platforms and must be professionaly produced.

Indeed, MOOC video productions affect the student's engagement, both before enrollment and during the course. For instance on the EdX platform, four main kinds of videos are found:

- a recorded classroom lecture
- an instructor's talking head
- a Khan-style digital tablet drawing (popularized by Khan Academy)
- a slideshow

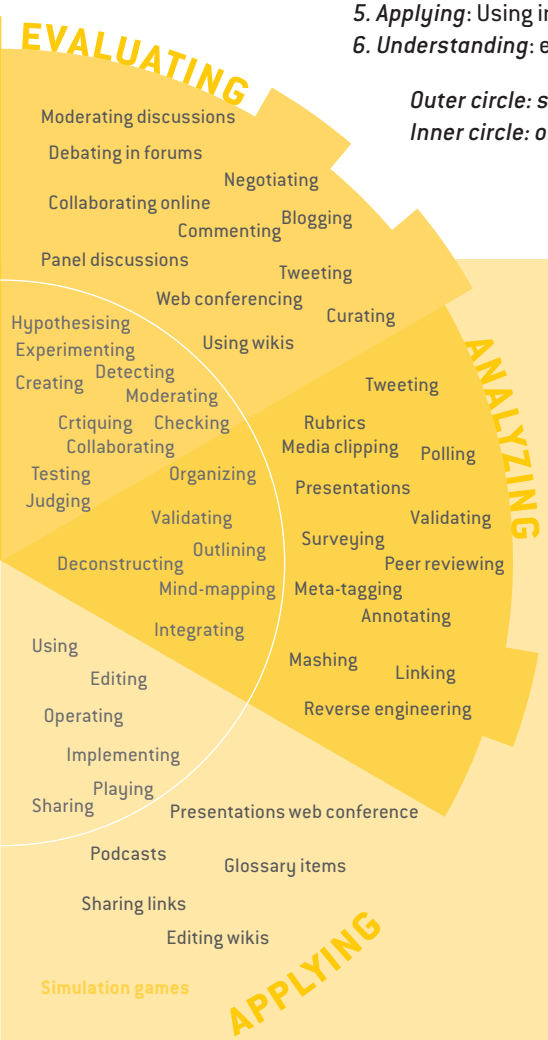
In what is probaby the largest-scale study of video engagement to date, 862 videos, 6.9 million video watching sessions from almost 128,000 students have been studied and presented in March 2014. Details about ***UX design*** pages 14 15 and a full report from EdX online can be found at http://goo.gl/NPZVbn



MOOC, every letter is negotiable!
(see pages 12 13)

1. *Remembering*: recalling information
2. *Creating*: generating new ideas solving complex problems
3. *Evaluating*: justifying a decision or course of action
4. *Analyzing*: comparing to explore understandings and relationships
5. *Applying*: Using information in another situation
6. *Understanding*: explaining ideas and concepts

Outer circle: student learning activities
Inner circle: objective verbs



Gamification

Is learning a pleasure or an effort?

The culture of the screen that allows playful access to content which generates immediate pleasure leads us to reinvent new ways to motivate and create the desire to learn, and practice critical thinking. [Simone, 2012] pointed out that tension can arise between the ***exopedia*** (education outside the school via the screens) and the ***endopedia*** (education at school) based on thinking and aptitudes of critical distance. How to recreate the ***libido sciendi***? Are ***serious games*** the way to learn? These debates merely reproduce the tension between an immediate and misleading, substantial world and the world of knowledge and ideas that forces to make an effort… In others words, a way to revisit the Socratic philosophy.

Thus, long before MOOCs were serious games (1970). At present, health education is one of the teaching areas were there exists numerous simulation games. It is, for instance, possible to train medical students in surgery without hurting patients, to teach them emergency gestures in stressful situations that can not be replicated every day, or to train medical assistants to detect hazards in apartments for the elderly.

Gamification is also used as another way to retain students within online course. Studies show that persistence is encouraged by introducing elements of game mechanics into the course. For example, interactive challenges introduced intermittently during the course will unlock the next step. This can be closely associated with badging (see below page 19) as it is now prevalent for people to have a profile or an avatar.

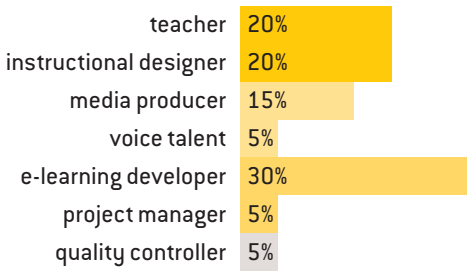
Mobile devices also help to develop gamification and professional mobile video games are already successfull in the educational world. Users can unlock additional content pays offs –the model of the in-app purchase– which is a well known and remunerative model in the mobile and Facebook worlds.

gMOOC (game-based MOOC) are one of the numerous variations of MOOCs. The course is done in a virtual world where it is possible to interact with other avatars and acquire social skills. This is also a unique opportunity to meet people not involved in the course.

Serious games and game-based online courses allow to teach disciplines where it is mandatory to manipulate costly objects or meet external people. This allows MOOCs in the physics, chemistry or biology disciplines. The virtual laboratory below is such an interactive environment developed for creating and conducting simulated experiments.

In the #FutureEd MOOC by Cathy N. Davidson, it was possible to meet tutors and peers from within Second Life.

Massive Open Online Courses



Estimation of resources allocated to the preparation steps of an online course.

In light of this team organization, it is useful to follow a proven method, particularily in case of the use of one platform such as Coursera or EdX. Rémi Bachelet, author of one of the first famous MOOCs in France, proposes an editable document to write MOOC specifications which can be found at http://goo.gl/RQo5X

> "MOOC is a course, virtualizing a physical experience"

How-tos and Time Spent

Massive Open Online Courses are a new format for online courses. ***"Open"*** means "open to everyone" and participation is voluntary. It is the learner's responsibility to decide upon which activities to undertake, what skills they are curious about, and what content they want to acquire. ***"Online"*** means that the courses are available online, but this does not mean that no off-line elements are used. Some teachers wrap MOOCs found out there in their own course. Some MOOCs imply physical meetings every other week. Indeed, every letter is negotiable, as explained in the following pages. MOOC platforms today pursue two objectives: offering highly scalable forms of learning to a ***"massive"*** numbers of learners, and offering blended learning to small on-campus classes.

The first question that arises when talking about MOOCs is how long it takes to prepare and what are the steps to elaborate these new forms of teaching. Depending on how specialized the learning matter is, how many elements and what sort of elements the course contains, this could take from 10 up to 100 or more hours to produce a single hour. It is evident that this must be the results of team efforts given the various skills necessary to produce such courses and this is not taking into account the execution time during which many tutors are mobilized.

However, too little MOOCs have yet been played several times and it is still too soon to know if the replay of a course will result in savings, but some believes that a replay can result in a cost-saving of two times less than the initial course.

The preparation steps of a MOOC are as follows: ***design***, ***record***, ***review***, ***edit***, ***check*** and ***publish***, which mobilize a workteam with many talents. First of all, the teacher, the **expert** who provides the initial course or content, is doing research on the matter and will probably be on screen to deliver the video lectures. Then comes the **instructional designer** in charge of translating the previous content in an engaging and meaningful manner. A **media producer** will produce the videos, create infographics, artwork, photos, and be responsible for the overall graphical interface. It may be necessary to recruit a **voice talent** to provide clear narration of the course, and in any case, it is necessary to write subtitles in several languages for addressing a large audience. There is also project management support, which comes into two different forms: the **e-learning developer** who combines all elements together and the **project manager** in charge of budget, costs and resource allocation. As user experience is the key to success, a **quality controller** must conduct testings before and during the execution of the course.

What does "massive" stand for?

When MOOC producers are asked to express their understanding of massive, they firstly define it as the actual numbers of course participants, then as the capacity of courses to enroll large numbers (more than 500, that is, the size of an auditorium), and finally as the capacity to obtain and process vast quantities of participant activity and student performance data.

As for Big Data, where "Big" is something too large to be computed easily in an everyday machine, "massive" could apply to any class environment that is too large to be handled in a face-to-face learning situation such as in a traditional lecture hall or an auditorium. "Massive" is also the range of interactions between participants in peer learning environments. This could reduce the number of participants to less than one hundred, or open the path to subgroups of one hundred participants and 10,000 interactions. As George Siemens, one of the fathers of MOOCs, says: "***Massive is anything that is large enough that you can get sub-clusters of self-organized interests. Three hundred or more students could be one benchmark; another could be Robin Dunbar's number of 150 people, which is the maximum after which the group starts to create smaller fractions.***"

Valuing the Community of Learners

Once its has been produced, the most valuable asset of an online course is undeniably its learning community.

While ***xMOOC*** enrollments may vary from a few hundred to hundreds of thousands per course, the average number of enrollments is usually into the tens of thousands. ***cMOOC***s are generally smaller, with a hundred or a few thousands participants, but this could change as the frontiers between flavors of MOOCs overlap.

There is always a significant **dropout** rate throughout an online course, from the "come once" attitude to the "get certified" objective, and the learner may encouter obstacles during the course, such as the "watch video", "video quizzes", "turn in assesment" and "do quizzes exercices". Only 10% of the initial enrollees complete a course. However, the real significant figure should not be the number of initial enrollees, but the number of people who complete the first quiz. It is reasonable to redefine the terms "dropout", "completion" and "success" which cannot be compared between higher education and online offers.

From the early analyses of completion rates, it has been shown that a learner's objectives and achievements depends upon his or her demographics and time constraints. One should offer the learners several different ways to experience a MOOC –different certificates associated with different workloads– reminding one that the ultimate goal is not necessarily a certificate or a diploma. In a Humboldtian view of modern teaching, participating by helping other students to learn or by proposing use cases may be as rewarding as doing all assignments and quizzes.

Recent research based on interviews of MOOC participants have shown than "***dropout means achieving their aims (or not) in a course rather than finishing it by completing all parts***".

Two solutions for reducing the dropout rate which come from reasons like lack of satisfaction or misunderstanding the course environment can be offered. The first one is mechanical: compute from the learner activity features the warning signs and patterns that can predict a next to come dropout, and alert the instructor. These patterns are known either from the ongoing engagement of the learner (eg, time spent, frequency of interaction), or from a mandatory pre-survey about the learner's motivations (eg, interest on the matter, reasons for choosing the course).

The second way to reduce the dropout rate is to engage learners in the community of learners. Large masses of participants must be divided into small cohorts of people with the chance that some will act as tutors for their peers. The first week of a MOOC is, in this respect, critical. A community of learners must be built and the forums, or writing a common Community Rule are among the tools that enable to forge one.

Gwendal Simon reported 240 hours of teamwork for the production of a 20-hour course (35 students in classroom and 350 outside) on the cellular networks MOOC held in May 2013. Other details include some ways in which to attract students and make all this work worth the effort: affiliation with a top-ranked university who knows how to advertise, or with a highly-visible platform like Coursera; proposing a very trendy topic and using buzzwords keeping in mind that most of MOOC students are professionals who want to be up-to-date with new topics; spending enough time to advertise the MOOC and to recruit learners.

http://goo.gl/JG90pv

What is regarded as "open"?

cMOOC, xMOOC, iMOOC... MOOCs refer to many different realities.

If the two main pedagogical strands of MOOCs are the cMOOCs (network-based) and the xMOOCs (content-based; most of the MOOCS created at present are xMOOCs), a lot of variations are coming to light. Research is being conducted to define a shared typology of MOOCs (see "***A Typology and Dimensions of a Description Framework for MOOCs***", by Marilyne Rosselle, Pierre-André Caron, Jean Heutte, in the Proceedings of EMOOCS2014).

Derived from the "massively multiplayer online role-playing games" (MMORPGs), the term connectivist MOOC (cMOOC) was first used to describe the 12-week online course entitled "Connectivism and Connected Knowledge" and offered by Siemens & Downes, to an audience of 25 students for credits and to an additional 2,300 enrollees who participated without paying or receiving credit. In 2011, the MOOC on Artificial Intelligence offered by Stanford University professors attracted 160,000 students. As it was quite different in form from the previous one, it was called xMOOC, "x" denoting "exponential" and massive participation, or "extented" (like in HarvardX and MITx). MOOC variations also include the tMOOC (task-based), ***SPOC*** (small private online courses), ***POOCs***, ***DOCCs***, and ***SMOCs***. See Glossary and References page 27 for an history of MOOCs.

	cMOOC	iMOOC	xMOOC
Learning goals	Opened	O	C
Choice of resources	O	O	C
Organization of the learning activities	O	Closed	C
Organization of the group work	O	O	C/O
Collaborative coproduction	O	C/O	C

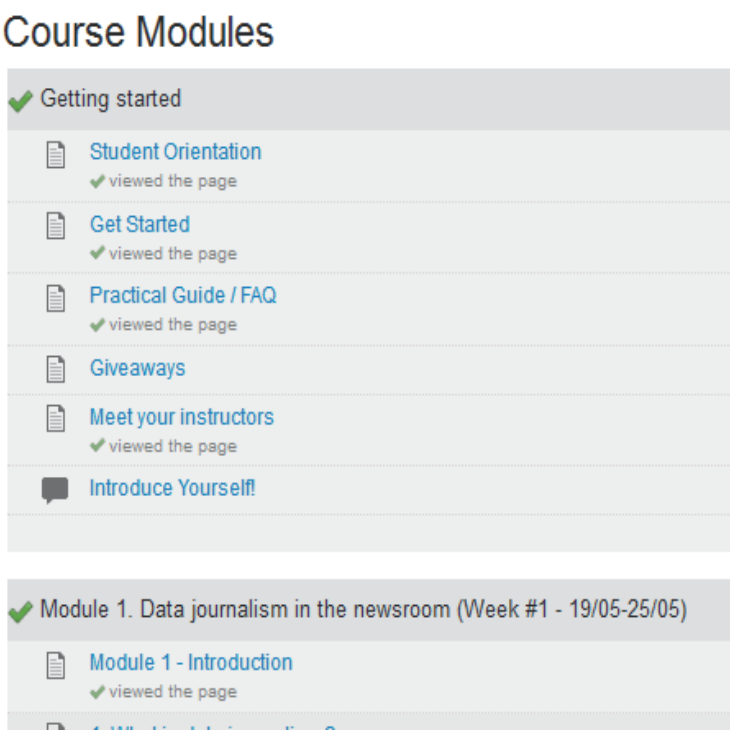
Derivated by Roselle, Caron & Heute, from Gilliot et.al work.

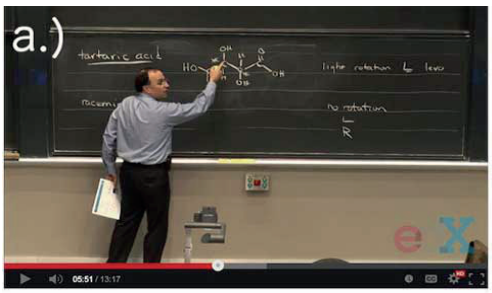
iMOOCs, proposed by Gilliot et al, offer more opened dimensions than xMOOCs and less open approach than cMOOCs. By opening up some dimensions that are closed in xMOOC, their main goal is to provide an investigative approach.

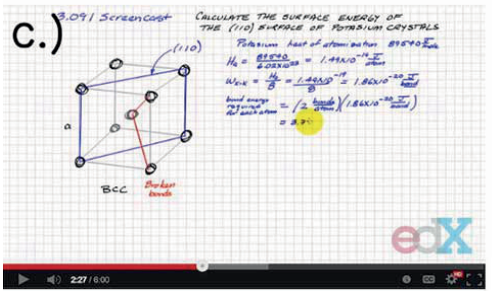
Within Online Courses, the User Experience is the Key Asset

Videos need special attention. *Right are the words of welcome for a course on the Canvas platform. 1'30 is dedicated to the rest of the module. The light is perfect and the background is not disturbed. Right page: a temporary studio for an interview outside the premises (FutureEd MOOC). Middle: on the platform EdX, videos are synchronized with contents, and several formats have been tested for a better engagement.*

First contact with an online course… *First week can be a blank one in terms of learning contents. Teachers, tutors and participants meet together and students are given guidance on a how to use the platform and the course.*



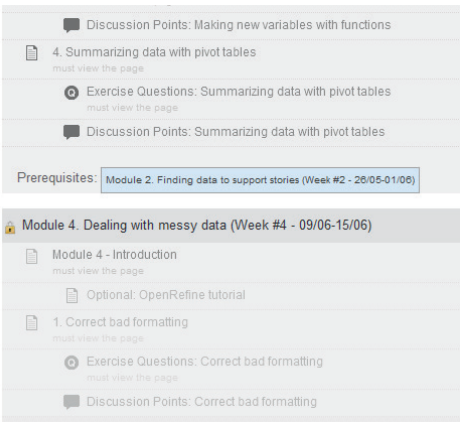


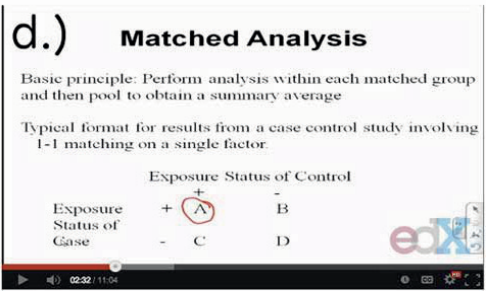


	Name	Section	Role
	Candace Ballard	Doing Journalism with Data	Student
	Mairi Pileggi	Doing Journalism with Data	Student
	Nisrinah Mat Kail	Pre-Registered	Student
	daniel .bramatti	Pre-Registered	Student
	Melanie Norton (Forthun)	Doing Journalism with Data	Student
	Natalia de Francisco (Shapovalova)	Doing Journalism with Data	Student

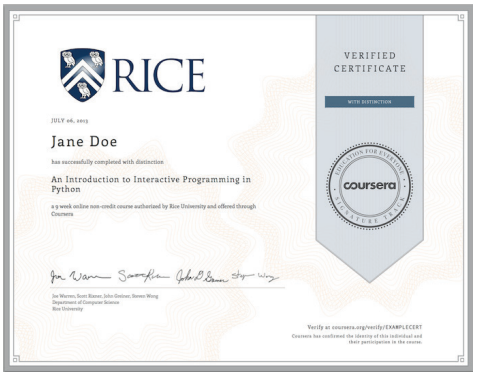
Sharing a course with thousands of others participants *(above: participant map for the FutureEd MOOC in January 2014) needs forum where one can identify others (left: the Canvas forum), and the use of social networks such as Twitter or Google+ (right page: community of participants for the "MOOC de A à Z").*

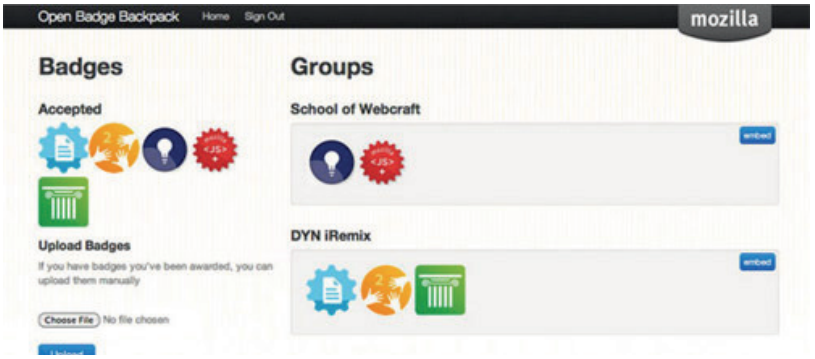
***After the first week**, students can navigate at their own pace, and content is unlocked as long as previous modules are completed.*





*At the end, **certificates and badges must be appealing**. The process of authentification must be simple: The Coursera platform asks you to webcam your ID card and match it with your face after every assignment.*





Further readings

How MOOC Video Production Affects Student Engagement

https://www.edx.org/blog/how-mooc-video-production-affects

French MOOCs map: http://www.mindmeister.com/fr/306359951/cartographie-des-mooc-fran-ais

French community "MOOC de A à Z": https://plus.google.com/communities/114968139191662533660

Costs and Revenues in the MOOC Landscape

From *"MOOCs: Expectations and Reality"*, a 210 page report published in May 2014 by ***Hollands & Tirthali***, Columbia University. It explores the goals of institutions creating or adopting MOOCs and how these institutions define effectiveness of their MOOC initiatives. However, as the authors say in the preface, "***MOOC phenomenon is not mature enough to afford conclusions on the question of long-term cost-effectiveness***". http://goo.gl/kmWQFC

The interviews with 83 stakeholders from 62 different institutions active in the MOOC and e-learning space offer the more recent survey on this topic.

A recent survey on 83 administrators, faculty members, researchers, and other actors from 62 different institutions active in online learning all over the english speaking world demonstrated that the major **cost drivers** in MOOC production and delivery were:

- The **size of the teamwork**, faculty members, administrators, and other instructional and support personnel involved both in the production and the delivery of a MOOC. This is barely less than five professionals per course, and in extreme cases this can go up to 30 members. Each of them spending several hundreds hours for every phase of the course.
- The **quality** of videography, sound records, interactive materials and graphics design: this was estimated at an average of $4,300 per hour for finished videos.
- The nature of the **delivery platform**
- The **technical support** provided for the participants
- The development, maintenance and delivery of **special features** such as computer code auto-graders, virtual labs, simulations, or gamification
- **Analysis** of platform data

Note that the cloud facilities are an ally for online courses, allowing contents to be stored and transmitted at very low cost, and machine learning algorithms to be used on the learning data produced by the participants (see pages 18 19).

Cost Estimation and Cost for Re-Run

Assuming personnel costs account for 75% of total costs once facilities, equipment, and overhead expenses are considered, the authors of the survey estimated that the total costs per MOOC wre around $39,000 and $325,300. This gives a cost per completer between $74 and $272. However, completion data, and otherwise revenue data from MOOCs are rarely made public and it is not easy to yield and accurate estimation.

Also little is known about the reduction cost for a re-run MOOC. A case study showed that a re-run of a cMOOC cost 38% less. This figure may differ strongly in case of an xMOOC, given the instructors' engagment during a cMOOC. Research on this topic must be performed.

Revenues

Current and future potential sources of revenues mentioned by interviewees in the survey included:

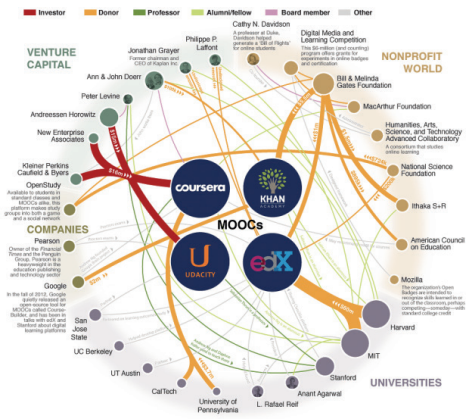
- Offering credits and charging tuition
- Creating new courses and programs
- Drawing MOOC participants into full-tuition degree programs
- Increasing class sizes

Potential cost savings from MOOCs

So far MOOCs have been a source of costs for higher education institutions, but savings are envisioned.

- Re-using MOOC materials multiple times
- Sharing MOOC materials across instructors and campuses
- Developing common courses to offer across institutions
- Replacing on-campus courses with MOOCs
- Faculty time savings
- Reducing the need for facilities
- Recruitment efficiencies
- Less costly student support services provided by non-faculty members
- Increasing student throughput

The business model of online courses is still far from being known.



A snapshot of the MOOC universe in early 2014, with platforms classified from profit to non-profit. It can be seen that platforms and universities are all working together, inventing the future of education.

- Licensing fees for the use of MOOC materials by other institutions
- Fees for additional services
- Grant revenues
- Matchmaking for employers

The business model of online courses is still far from being known. It may be due to the fact that new types of MOOCs are invented every day and that research and experiments are still underway. Yet Higher Education institutions invest their own funds or produce MOOCs through research projects or with the help of donors. They should build on the achievements of startups issued from their research on pedagogy, insofar as these startups will soon find the most effective business models.

In this respect, Udacity, one of the first educational startups, pivoted last year and focused explicitly on disrupting job-training. Their MOOCs are now designed for the private sector (SPOCs) and not on disrupting university education. Unlike Coursera that only works with prestigious universities, Udacity creates its own content and rarely cooperates with universities. In addition, Udacity decided to tackle the problem facing all MOOCs – the dropout rate.

This may be an option... Let the startups explore all the digital education challenges, while High Education institutions pursue other objectives, as long as they keep an eye on these startups. Inventing a business model in which the entity that produces the course is not the same as the one that delivers or certifies the course.

Institution Brand Visibility as a Driver

In a global competition model, building, reinforcing or protecting its brand is a major goal for High Education institutions. Through their MOOCs, elite institutions protect their global ranking among top universities, whereas second ranking universities try to gain national or international recognition. "*For European universities which must generally educate domestic students for free or at very low tuition rates, MOOCs may help attract international students who are an important source of income*" explains furthermore the aforementioned survey. Brand development is indeed a tool for recruitment, both for the domestic audience and the global community. This could even initiate a virtuous circle with alumni from abroad willing to finance future research and courses of the university they discovered online.

From the Learner's Point of View

"*Is crowdfunding a viable solution to the problem of students' debt?*" This question is now seriously asked in the United States, and there are numerous cases of teaching or research which have now been financed by sponsors found on a crowdfunding platform.

In France, Jean-Mark Nourel, founder of Eduklab, is developing such a crowdfunding platform dedicated to education. According to him, helping students to finance their education is an act of citizenship. Launched in late 2013, the plaform allows students to collect money in order to carry out humanitarian, community or professional projects or to finance all or part of their graduate studies.

The next question will soon be: "*is this diploma worth the cost?*". Antoine Amiel, founder of Learn Assembly, a French digital university for entrepreneurs asks himself: "*Why study 5 years, going into debt over 10 years to get a degree while it is now possible to achieve the same result in three months, for a very small fee?*". The first trainings that are currently impacted are those about digital literacies. The so-called "BootCamp", launched by startups like DevBootCamp, Wagon or Simplon in France, are already a success. Learners are searching for immediate employablity. "*Recruiters, whose needs for developers are growing, often seek versatile profiles, truely flexible Swiss Army Knife. This ability to be independent and keen on lifelong learning is an essential criterion for startups and innovative businesses*", says Amiel.

Higher education institutions should think about it. What is the purpose of education? It was previously to teach the working force, it is now to teach how to learn, unlearn and relearn in an adaptive way. Both objectives can be pursued if institutions can unlearn themselves and reinvent efficient ways to teach the next literacies.

Evaluation: from Grades to Badges

From Big data to massive education

"MOOCs need to exploit the latest breakthroughs in data processing and machine learning. Delivering a complex class to thousands of people simultaneously demandsa high degree of automation."

Nicholas Carr,
The Crisis in Higher Education, 2012

http://goo.gl/CfqRY

Diplomas are questioned because they may not have anymore the value they had once in the past. Indeed, we live at a time where it is not shameful to earn a degree, insofar as we can be successful in life without graduating (diplomas do not either guarantee life-long employment).

So what is the purpose of grades? "*A grade is an inadequate report of an inaccurate judgment by a biased and variable judge of the extent to which a student has attained an undefined level of mastery of an unknown proportion of an indefinite material*", says Paul Dressel in *Grades: One More Tilt at the Windmill*. Grades exhibit all sort of motivations for students, from the mere idea of exchanges (the grade is used as a proof of achievement: I did my work until the end, the teacher gave me a grade back) to a higher idea of assessment (the grade represents a level of mastery, it is a proof of a learning process). Besides, it seemed necessary to measure some sort of progression so as to obtain a grade.

How do we Measure?

Mid-terms, essays, quizzes, and final exams are traditional assessments, but how do we measure the progression of a mass of students? Standardized tests were the answer for teachers facing hundreds of students, and this remains true in the context of MOOCs with *multiple choice machine-graded tests*, *automated metareviewing*, and *system for machine-read peer-review feedback*.

Cathy N. Davidson likes to explain to people who want to rethink Education the origin of multiple-choice testing. "*That's not just a rhetorical question*", there is a father of multiple-choice tests, his name was Frederick J. Kelly, and he invented them in 1914. Davidson pursues: "*To make the tests both objective as measures and efficient administratively, Kelly insisted that questions had to be devised that admitted no ambiguity.*" Summative, standardized tests reduce learning to one "correct" answer. They are about facts, not critical thinking or creative expression. *"For Kelly, effective teaching meant uniform results. In this, he was a creature of his age, prizing a dependable, uniform, easily replicated product – the assembly-line model of dependability and standardization – over ingenuity, creativity, individuality, idiosyncrasy, judgment, and variability.*"

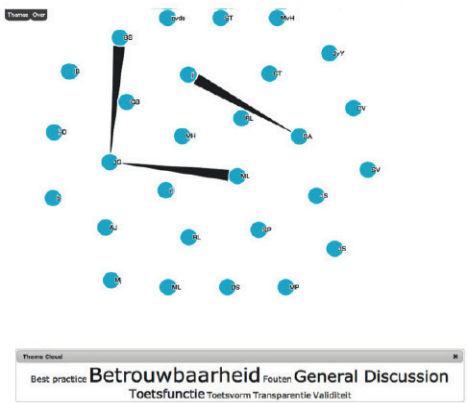
One hundred year later, it is time to read writings of Kelly who changed his mind at the end of his life: "*College is a place to learn how to educate oneself rather than a place in which to be educated.*" Indeed we must today take the chance to avoid the drawbacks of a computed education that swears only by standardized tests. Computed tests could help both teachers (and the institution they belong to) and students.

Here is how quizzes can be used in online courses, helping both to measure students' work and to reinforce their learning. As it was stated at the beginning of Davidson's Higher-Education MOOC, "*the research confirms that the best kind of testing happens often, as you are learning, and as a way to reinforce what you are learning. We are making every effort to take the simple quiz format in Coursera and make it as valuable a learning tool as possible. Thus, even though we ask for the best answer in the quizzes, we never give you false or wrong information. That way, everything you read in the process of finding the best answer also reinforces sound information or ideas in the learning research.*" In case it is necessary to validate a level during the course, it is still possible to accept a limited number of attempts to the quizzes, allowing for reinforcement and avoiding all participants to get the A-grade.

Tacit Knowledge Prominence, and How do we Measure its Acquisition?

Knowledge management has tried for a long time to provide the capitalization and transfer of knowledge in organizations, in connection with the awareness that the value of a company lies in its knowledge and expertise, and that it is necessary to preserve them to allow their transmission. It has become a discipline in itself and many tools and approaches have been proposed as solutions. The approach was very technocentric, however these attempts have not yielded satisfactory results. Large budgets were made for solutions without their use case. These technology-oriented approaches have been challenged by more human centered approaches that promote the concept of ***community of practice***. Knowledge lives and is mainly transmitted informally in groups by

What is demanded at school is the ability to be truely evaluated and guided.



Social learning analytics in a MOOC environment: exhibiting interactions between participants http://goo.gl/F0y0Da

more subtle and distributed mechanisms than a mere transmission of knowledge. The concept of community of practice says that much of the learning takes place in groups of people who share a framework for activities. In other words, this approach acknowledges that there is tacit knowledge that can not be formalized and put into machine, and instead circulates informally.

These advances in the field of knowledge management shed light on two educational issues: they indicate firstly that learning occurs within a group. Within the school this takes place between teachers and students in a class, and between students themselves, and therefore the interactions within the class play a key role in learning. They also show that the digitization of knowledge has its limits, for all tacit knowledge completely escapes from this formalization .

Evaluation & Badging

We saw above that the analysis of the data collected from each participant in an online course can be used as a mean to detect a next-to-come dropout, but this is not the sole purpose.

The information gathered can be visualized by teachers (helping to detect a student having diffculties in a topic or a particular assignment), the student itself (helping to measure its progression) or even the cohort to detect where conversations take place and whom of their peers give attention (for instance, in a context of peer-review exercises or peer-to-peer editing).

Learning analytics can also be used to adapt the rythm of the course to the learner, or, as Khan Academy says, to propose "***what is the best next thing for you at your own pace***". This is what is called adaptive learning: building a personalized learning path that responds to ongoing assessment and based on performance.

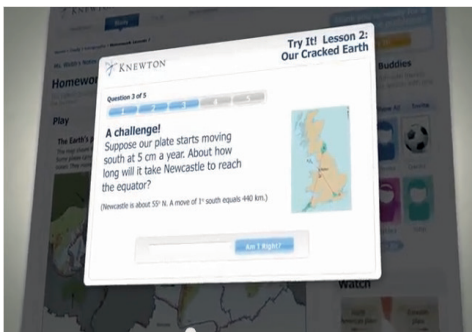
Badges come to assess that a particular skill, competence or knowledge has been acquired. A digital badge is "***a validated indicator of accomplishment, skill, quality or interest that can be earned in many learning environments***". These new modes of assessments are tools for identifying and validating people's accomplishments, informal and self-driven learnings, and allowing them to connect to each other. Badges are add-ons to the university degrees, but they tell a different story: by earning badges students can differentiate and share their stories. Badges can be earned, issued, and easily published on social media, like LinkedIn. A vast ecosystem of badges is growing up, and attention is given to the Open Badge ecosystem from the Mozilla Foundation.

Big Data for Education

Jose Ferreira is the founder and CEO of Knewton, an education technology company that personalizes digital courses for avoiding dropout. This entrepreneur thinks that Education is the next big thing for big data. Knewton provides a platform on which adaptive learning applications can be created. On a Knewton-powered course, thousands of data are crunched, such as time spent answering questions from a quiz, the number of correct answers, the differences in behavior depending on the time of the day and the movements of the mouse on the screen. Not only do these data help students, but also teachers. Actually, they are used both by students to adapt their course, and by teachers who can see after each course what was done by each student, group them by group level and give them problems on a particular topic on which they were stuck.

In December 2013 Knewton closed a $51 million round of funding, its fifth funding since its creation two years before. This is one of the startups which are paving the path to the future of Education.

"*No two students come from the same background or learn in the same way*"
http://www.youtube.com/watch?v=LIdxxVRj4FU



The Startups of Education

"*We are busy reinventing feedback*": this is the motto presented on Sentimy website, a startup founded by students and that has been located in the Telecom Bretagne incubator since September 2013.

"*We think that the world of education is sorely lacking in feedback*" says one of the students, "*Teachers work their way through their syllabus without ever really knowing how their classes work specifically, and students do not necessarily dare to submit ideas for improvement. Our feedback web platform allows to open up dialogues.*"

http://www.sentimy.com/

Will startups reinvent Education at large? According to Knewton's raising funds, there is no denying that something is stirring. And as startups cater to the multitude of people, they may target all those who do not have access to education. In many emerging countries, the development of digital technology and mobile networks allows people to override the lack of infrastructures or services. This is particularly true in Africa in the field of banking, payment and transfer of money. And this is becoming true in the field of education too. In countries where the literacy rate are lower than 50%, applications are being developed to compensate for teaching inequalities. In Kenya, one of the Africa countries in which startups are developing rapidly, the eLimu tablet involves Kenyan primary school students in the learning process. Its objective is to improve both the quality of education and citizenship.

http://e-limu.org/

Pupils are asked to access knowledge via mobile devices and have to use them all their life. In a global context, language cannot still be a barrier and they will quickly find applications that transform language learning into a game, as Duolingo does. It is both a free language-learning and crowdsourced text translation platform. As users progress through the courses, they simultaneously help to translate documents. More than 12,5 M users are active on the application, and this innovative model has been recognized by Apple. As a matter of fact, Duolingo was chosen in 2013 as iPhone App of the Year and it was the first time this honor was awarded to an educational application.

https://www.duolingo.com/

In France, Gymglish sends each morning an e-mail with a couple of written content and audio recordings. Each lesson takes ten minutes to complete. The next lessons are customized according to previous answers, and the expectations and needs of the user. Gymglish aims four markets: individuals who want to improve their English in a fun way, companies for corporate training, universities as an effective and motivating course for their students, and language schools as an ideal add-on to the in-situ courses.

http://www.gymglish.fr/en

OpenClassrooms, formerly known as Le Site du Zéro, a French website full of tutorials, has just completed a new fundraising of one million euros from its historical investor Alven Capital. The funds will allow the e-learning site to publish new educational content under a variety of media, including MOOCs. This well-know French platform is about to democratize access to the MOOCs in the country.

http://fr.openclassrooms.com/

Other startups have been striving to democratize digital education and to help other entities to produce online courses: http://themoocagency.com/ or http://www.unow.fr/ . The latter was the first startup in France working on the MOOC topic, and has issued a white paper on the first feedbacks.

Co-Create Online Courses

All these innovators have been collaborating in the so-called "Education FrenchTouch" organized by the startup Learn Assembly.

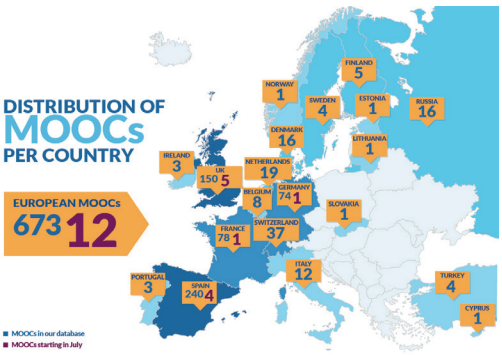
http://www.frenchtoucheducation.com/

http://www.learnassembly.com/

They organize events in higher education institutions and some other places to share insights on the future of education, with teachers, researchers, students, employers and other innovators.

Finding the Right MOOCs in Europe

Numerous MOOC or MOOC platform initiatives have been launched in Europe these recent years. **Iversity** (https://iversity.org/), is based in Germany and was launched in 2011/2012 as an international think-tank, with the goal to push education into the digital age. In Spain **Miriada X** (http://www.miriadax.net/) was launched in January 2013. It is designed to facilitate exchanges and cooperation between Spanish and Latin American institutions. **OpenupEd** portal (http://openuped.eu/) was launched in April 2013. It is "***the first MOOCs initiative which goes Europe-wide, with the support of the European Commission***". Courses covering a wide variety of subjects are available in 12 different languages. **FutureLearn** (http://www.futurelearn.com/) was launched in the UK in September 2013. **France Université Numérique** (FUN https://www.france-universite-numerique-mooc.fr/), France's Massive Open Online Course platform launched in autumn 2013 by the French Ministry of Higher Education and Research, reported its first figures in May 2014. More than 260,000 people have registered since January 2014 following one of the 36 MOOCs posted on the platform FUN.



The **Open Education Europa initiative** maintains a scoreboard of European MOOCs up-to-date (http://openeducationeuropa.eu/en/european_scoreboard_moocs).

673 MOOCs were listed in the database in July 2014, among them twelve were just starting. Their topics range from Science & Technology to Business, from Humanities to Arts, from Natural, Social or Applied Sciences to Mathematics and Statistics.

The Institute Mines-Télécom (IMT) and its partners –notably partners of the Fondation Télécom– offer a range of MOOCs that can be used for long-life learning. The reader will find page 27 some of the referent teachers involved in the IMT schools.

Current IMT online courses are listed on the FUN platform at https://www.france-universite-numerique-mooc.fr/university/courses/MinesTelecom/ while all IMT MOOCs are listed and discussed on http://www.mines-telecom.fr/formation/les-mooc/ and http://www.mooc.fr/

References and further readings

Raffaele Simone, *Pris dans la toile*, Gallimard, 2012

Invasion of the Moocs. The promises and perils of massive open online courses. Edited by Steven D. Krause and Charles Lowe. April, 2014
http://fr.slideshare.net/mariajanethrios/invasion-of-the-moocs-the-promises-and-perils-of-massive-open-online-courses

James Grimmelmann. *The Merchants of MOOCs.* University of Maryland Francis King Carey School of Law. November, 2013
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2358253

EMOOCs 2014, the Second MOOC European Stakeholders Summit, held on February, 2014 in Lausanne
http://www.emoocs2014.eu/
Proceedings: http://www.emoocs2014.eu/sites/default/files/Proceedings-Moocs-Summit-2014.pdf

ClassX: an open source interactive lecture streaming system
http://www.academia.edu/2578485/ClassX_-_An_Open_Source_Interactive_Lecture_Streaming_System

Globalizing Higher Education and Research for the 'Knowledge Economy'. The main objective of the course is to enable students to better understand how and why universities are engaged in the globalization process, as well as what the key implications of this development process are.
https://www.coursera.org/course/globalhighered

From Grades to Badges
http://openbadges.org/
http://www.hastac.org/collections/badges-learning-research

Jean-Marie Gilliot's blog about *Innovation in Higher Education*
http://tipes.wordpress.com/

3. Hacking the Future of Education

We now propose challenges for the future of education. These are actually topics of research that are being explored and questioned in the call for papers for peer-reviewed publications and symposia.

We have grouped them into major themes, themselves ordered to arise from each other. From the necessity to redefine and make shared typologies for the MOOCs, to the study of their usefullness, through learning techniques, big data for education or design, these are all questions that allow us to go beyond the current hype for MOOCs and consider them as a first step toward a new kind of education.

We will close this *"cahier"* with three scenarios to come or already begun: the widespread use of mobile devices in education, the disappearance of the classroom (education everywhere) and the arrival of extreme learners.

But first of all, let us deal with some of today's open debates, and possible breakthroughs that could upset educational institutions as we know them today.

Open Debates

As it is often pointed out, school models are on the verge of implosion. Different scenarios are possible, see the 5 breakthroughs proposed by the FING below. A profound transformation of the school system could preserve the idea of a single school for all, provided we initiate changes in depth.

The most likely scenario, however, is that of a fragmented school that emphasizes differences and hierarchies, with private or faith-based schools.

The second issue that appears is about the future of schools themselves: the end of schools versus schools as learning organizations. Thanks to self-learning, home schooling and lifelong learning processes, the end of school as we know today is a possible scenario. Training in the walls of the school could be an outdated model: one could imagine a return to an earlier situation where training would take place within families or in other environments.

ICT makes possible to consider training systems at home (home schooling) and at a distance (students perform their work online, yet being remotely coached).

More generally speaking, the model of self-training throughout life seems to look for new configurations. The school as an organization can also be transformed from within, reconfigure itself to recombine to other actors.

A final issue is the capacity of the school to open to the outside world. One path could be a "separated school", disconnected, which continues to operate as an autonomous system with its own bubble and claiming the autonomy of the field of training. Another path is to imagine an integrated school, connected with the world of business, connected from secondary to higher education and research, otherwise known as a more outward school.

In the education sector, the injunction or need to make a breakthrough comes from external forces: the rise of the Internet as an institution of knowledge, the behavioral changes of students facing higher educational institutions, and facing knowledge and finally the increased global competition, when education systems are evaluated and compared in terms of efficiency (PISA surveys in Europe for secondary education, various rankings of academic institutions, Shanghai et al.).

Whereas injunctions are largely external, it is quite natural, that schools have to struggle to reform. This contradiction between the internal and external forces foreshadows future tensions and may result in different routes. However, in France, it is likely that a diversified model has been taking over, schools are being created at different speeds and they tend to adapt to the demands of an increasingly diversified audience.

Recently in France, the FING (***Fondation Internet Nouvelle Génération***) has issued its lastest *"cahier d'enjeux"* (issue book). For participants who contributed to the writing of this open research work, five breakthroughs could reshape the landscape of education and be possible futures.

- **Polarization**: the alliance between major universities and technical platforms polarizes the market for higher education. Apart from a few countries that resist, other nations want to buy "smart universities" off the shelf and most universities become affiliated to larger one. Three languages represent an overwhelming majority of the offer. Curriculums, contents, assessment standards homogenize, which facilitates mobility but reduces diversity.

- **Unbundling**: started with digital work environments and MOOCs, digitization of higher education extends to all functions and leads to a complete unbundling of supply of higher education: content, media, venues, support, practical materials, evaluation, administration become autonomous bricks competing on a global market. Training offers become incredibly complex, any national strategy is virtually impossible. Syllabus Designing requires a financial and cognitive investment constantly renewed.

- **Neuroscience data and gamification** are combined to produce a teaching that offers a personalized dialogue with teachers and computers and that enables to evaluate, monitor and adapts continuously in strong interaction with employers. Former MOOCs have also become sources of "educational seeds" that expert systems assemble in the manner they seem most appropriate for each student.

- **Teacher shortage crisis**: in face of the MOOC "star teachers", gamificated digital alternatives, and increasingly virtual and remote relationships with students, teachers must find their place: abandon the lecture-room and focus on applications, become editors or curators, switch to completely different methods? The current period is exciting for some teachers, but confusing or demoralizing for many others.

- **Local and face-to-face alternatives appear**. Some of the students do not adapt to digital education. The face-to-face demand remains strong, territorial actors do not resign themselves to global offers. For students who choose local training, globalized knowledge seem reducing and inadequate.

These five breakthroughs could happen one after the other, or simultaneously, or in a differentiated manner across countries. From this perspective, education may well become an industry like any other, and it would be wise to consider first what the digital age has brought to other areas such as music, books and movies…

Topics of Research & Challenges

The mainstream newspapers declared 2012 "the Year of the MOOC", however research is its infancy in terms of Massive and Open features. Yet, an already important amount of research is being conducted, finding its root in the e-learning research and there is more to come.

It is interesting to read the Call for papers about Online courses, MOOC, or Learning to scale workshops, as it gives insights into the kind of research that is proposed, either for short or longer term. As was stated in a recent CFP, *"Through a combination of the properties of self-service, self-paced structures, peer feedback and assessment, adaptive offerings, and more, there is a wide open design space for online courses, and many elements of interactive learning systems that are not well understood."*

http://tochi.acm.org/si/online-learning.shtml

A special issue of ACM Transactions on Computer-Human Interaction had a deadline for submissions in late May, 2014. The special issue is due for early 2015. It is clearly stated that a lot remains to be understood, and what is happening with Education is a living topic of research. "*In this special issue, we aim to improve our understanding of the use of technology to support learning at scale. Through a combination of the properties of self-service, self-paced structures, peer feedback and assessment, adaptive offerings, and more, there is a wide open design space for online courses, and many elements of interactive learning systems that are not well understood*".

In the following pages we will outline some of the prominent topics found in the literature and discuss them.

Typologies

First of all, we have to define what we are dealing with. We need to distinguish and categorize MOOCs according to their pedagogic style, before conducting any research or evaluation on them. Swan, Bogle, Day, and Matthews (2014) introduce an instrument to categorize the MOOCs: AMP, "Assessing MOOC Pedagogies". What is at stake is the possibility to find relationships between the learning design strategies employed by the MOOCs and the specific student's outcomes, such as dropout, effectiveness of learning, in various subject areas. Indeed, the current assumptions about the dropout rate and effectiveness of MOOCs come from earlier works on educational systems that were not Massive and not Open. It is not possible to forecast from these previous environments, and it is urgent to re-conceptualize, and share a new set of variables.

It is worth noticing that few MOOCs are trying to address this issue, and do not measure if their participants are gaining, or not, knowledge or skills at the end. Along with the typology process above, we must find metrics to assess the impact of MOOCs, and first of all, be able to class them according to their objectives.

- Taxonomies and classifications of online approaches

Understanding the M Issues

What are the differences between massive and smaller scale experiences? And what does massive mean exactly? Massive could mean hundreds of students, or thousands, or hundred of thousands of participants as it has already been the case. How do we handle this situation, and we do not focus here on the digital part that can find solutions within the cloud assets. We are actually turning the spotlight on students themselves: how are they impacted by the fact that they are one in this crowd. How do we give them the feeling to be unique confronted with other people (teachers, tutors, peers) who have knowledge to share?

Data, Big data & Analytics

Some of the issues that we may encounter include: how do we use educational data mining and machine learning to effectively store, make available, and analyze data for different purposes? How do we ensure security and privacy of student data? How do we address the deluge of data, new data mining and database techniques? Who are the potential consumers of these data, e.g., how can data be distilled for assessment content so it is useful for each stakeholder? How can machine learning of student models be used to bring students together in like or otherwise complementary learning cohorts?

- Student behavior / learning analytics : metrics to find that are adapted to the objectives the students give to themselves.

- Analysis of Log Data

Automation

- Tools for Automated Feedback and Grading

Teaching Techniques

We have listed above in this *"cahier de veille"* a large number of learnings adapted to the digital age and its literacies, from blending learning to adaptive learning. More models could be invented, from all the type of MOOCs that exist, from the interactions that participants are generating from the new devices that will be on the market.

- Blended & flipped classes - how MOOC style teaching can be re-purposed in face-to-face settings

- New learning and teaching techniques at scale

- New learning and teaching techniques in poor quality of service: low-band mode, small screens and asynchronous learning due to lack of persistent connections

- Studies of application of existing learning theory

Adapting to learner's abilities

- How do we develop learning models that represent what learners know, along with when and how knowledge was learned?

- How can algorithms identify pedagogy that worked best for each individual?

- How can intelligent ambient environments reason about students' cognition?

Human Computer Interfaces & Design Issues

This is a key issue and it has been included in this *"cahier"* at a central place. Students drop out the brick and mortar universities when users' experience is disastrous: overcrowded classrooms, feeling of being anonymous when your teacher does not know your name.

It will be the same for online course. Bad sound tracks on video materials, supplementary material not available, difficulties to navigate into the forum… will all be good reasons to drop out. There is a need to understand which design is the more appropriate for certain learnings and participants' objectives… Furthermore, as the Humanities are going back to the digital classroom, designers must be associated to the production of MOOCs at the very beginning. Once again, here are some of the topics that one can found in the MOOCs symposiums.

- Interface, interaction, & experience designing

- Understanding design issues

- Usability studies

- System implications on design as well as design implications on systems

- How do we address the communicative interaction between learners and software and how do we use multimedia to switch modalities as appropriate?

- What integrations/mash-ups of devices/ platforms would more effectively handle learning distributed across time, space and media? Which leads to social learning…

Social Learning

How can platforms support student collaboration? What makes teams working correctly in virtual and collaborative learning environments? What are the new devices that enhance collaborative learning and production of knowledge when students are face-to-face? How do we match learners with other learners, with or without mentors? How do we comprehend learners' communities? How do learning communities stay alive beyond the course?

- From the classroom to the cohort

- Combining in-situ and online participants in a whole learning class

- What interfaces best support computer-supported collaborative learning, both collocated and at a distance, both synchronous and asynchronous?

- New models of social engagement for learning in MOOC environments

- The pathologies of large online social groups, if any

Roles of the peers

- Peer assessment & feedback

- Peer support during learning

Tutoring

- Adaptive learning & tutoring systems

- Role of teacher assistants and instructors

Influences

- How deadlines affect students in large scale classes?

- How self-paced structures affect motivation?

- How competition affects participation and success?

- Cultural Issues: how international students influence feedback, course discussions, etc.

Explore new disciplines

Not all higher institutions will be able to offer the same courses as others on fundamental disciplines. Moreover, institutions specialized in the digital knowledge will soon face a lot of competition. It will be necessary to develop online courses on specific topics, on new literacies, on topics connected to the world challenges (energy, health…) or the understanding of today's events, and above all, foreign languages.

Sharing & Remixing

- How one instructor can use the online material from another?
- How to produce MOOCs with other institutions, or use components from other MOOCs, and make cohorts going from one MOOC to another?

Signs of Success

- What prior experience, skills & knowledge is necessary for student's success?
- Does knowledge acquired online has the same retention and long term use than knowledge acquired traditionally? Is this a matter of age? Is there a difference between digital natives and those who are not?
- Are MOOCs similarly accepted by the teaching profession and the participants across countries? Is there a risk of a new digital divide between countries?

Make mobile devices enter the classroom and learners escape outside

Maria is no longer at the university. She was transferred by the dean because she was caught with her cell phone during an exam. She was even not using it, not this time, but that was the rule. All your knowledge must go out from your brain. Alas, in our time where a majority of us watch screens every minute or so, it is still not possible to give credit to people who have learnt to outsource their knowledge and know how to navigate in the common, ever changing, co-produced digital knowledge.

It would be probably a major fault if we were not able to tackle one of the main challenges of education: bring mobile devices into the classroom, use it with content validated and recommended by teachers, and let then pupils and students continue to access to educational content outside the walls.

No more classrooms, the World has become your teaching premises

Because the next challenge is to "***enable education that is so ubiquitous and embedded that it hides in plain sight***". This is what comes beyond MOOCs. Through the instant access to online knowledge, thanks to your mobile devices and augmented reality device, every minute of the day can be an opportunity to learn. In this context, there is no need for grades: this is social structured learning organized in a flow, and an aggregation of microlearning experiences driven by social rewards.

Marina Gorbis' article, "The Future of Education Eliminates the Classroom, Because the World is Your Class" http://goo.gl/IRyNC

Arising of extreme learning

The future of higher education may not lay solely in the long tail, but in the arrival of extreme learners, who have learn to learn, love to learn, design an everending curricula from the mass of online courses, seek online and off-line their tutors, curate knowledge all day long, join community laboratories, do open science, live in hackerspaces. They even use neurosciences and self-quantified process to better understand their brain and learn better, with the most of their capacities.

These extreme learners are shaping the future of higher education, and it is necessary to understand their practices and their motivations, as they will probably invent the new learnings and outdate what seems so hype today.

Working with the Institut Mines-Télécom

This *"cahier de veille"* was written with the help of several **contributions** from the various schools of the Institut Mines-Télécom and it has also benefited from discussions with the corporate partners of the Fondation Télécom. Teachers and researchers have been working for several years on the learning process and have been among the first institutions in France to develop massive open online courses. Following are some contacts within the schools.

Jean-Marie Gilliot, associate professor in Computer Science at Télécom Bretagne. His research interests include mobile learning, open learning environments and adaptive distributed software systems. With 3 other colleagues, he proposed the first French-speaking MOOC, which took place in 2012, about learning with the Internet. He is currently the project leader for MOOC development at Institut Mines-Télécom. ***Serge Garlatti***, professor in Computer Science at Télécom Bretagne. His research interests are collaborative learning, formal and informal learning, knowledge management, mobile learning and web 2.0 tools. ***André Thépaut***, professor at Télécom Bretagne, whom some of the research interests are instructional design, is at the origin with a colleague from ENSTA Bretagne of the symposium "***Questions de pédagogie dans l'enseignement supérieur***" (instructional design in higher education). ***Gwendal Simon***, associate professor at Telecom Bretagne, is a strong advocate of active learning. His research interests include large-scale distributed networks, peer-to-peer and ad-hoc networks, optimization problems and video delivery systems. ***Valérie Baudoin*** is an associate professor in Sociology at Telecom ParisTech. Her research interests include the digital writings, cultural practices, Internet uses and innovations. ***Rémi Sharrock*** is an associate professor at Telecom ParisTech. His research focuses on Autonomic Computing and its application to large scale distributed systems, Green IT, Inverted pedagogy and MOOC. With a colleague Mathieu Cisel from ENS, he proposed a MOOC about MOOC (MOOC de A à Z) in May 2014. ***Nicolas Aurray*** is a lecturer in sociology at Telecom ParisTech. Among his research interests are the construction of identity for teens and youth, using games and seeking recognition on social networking. ***Marine Campedel*** is a researcher and teacher at Telecom ParisTech. Her research includes image processing, knowledge engineering and machine learning. ***Annie Gentes***, professor at Telecom ParisTech, is also the head of the Co-Design and Media Studies Lab. All her projects put into practice a co-design methodology, associating researchers in engineering, design and media.

Additional documents are available on the partner area of the site of the Fondation Télécom.

Glossary

adaptive learning: *an educational method where computers adapt the presentation of educational material according to students' learning needs, as indicated by their responses to assignments.*

blended learning: *a learning process where a student learns both at a brick-and-mortar facility, as well as via online delivery. It covers a family of several distinct models.*

cMOOC, connectivist MOOC: *a MOOC where learners are expected to make an active contribution.*

community of practice: *a group of people who share a craft and/or a profession. Members learn from each other within the group through the sharing of information and experiences.*

connected learning: *defines learners as people interested in what they are learning, wishing to have peers and mentors sharing the same interests, and directing their learning towards opportunity and recognition.*

DOCC, Distributed Open Collaborative Course: *initiated by the FemTechNet in 2013 as a networked learning experiment involving instructors and students from several institutions on the topic of "Dialogues on Feminism and Technology".*

endopedia: *knowledge acquisition in a safe and organized place (eg the classroom).*

e-portfolio: *a type of learning record that provides actual evidence of achievement.*

exopedia: *knowledge acquisition outside the classroom*

flipped classroom: *a form of blended learning (see above) in which students learn new content online by watching video lectures, the classroom being used to do what were usually assigned problems at home. Teachers are no longer performing lectures, instead offering personalized guidance to students.*

game based learning: *games explicitly designed with educational purposes.*

gamification: *the use of game thinking and game mechanics in non-game contexts to engage users in solving problems.*

liberal arts: *subjects or skills that in classical antiquity were considered essential for a free person to know in order to act as a citizen. Nowadays, liberal arts refer to literature, languages, art history, music history, philosophy, history, mathematics, psychology, and science.*

libido sciendi: *Libido sentiendi, libido sciendi, libido dominandi are the three types of desires as defined by Saint Augustin. Libido sciendi stands for the desire of knowledge acquisition.*

LMS, Learning Management System: *a software application for the administration, documentation, tracking, reporting and delivery of e-learning education courses or training programs. Learning Content Management System (LCMS) is a companion software focusing on the development, management and publishing of the content delivered via an LMS.*

MOOC, Massive Open Online Course: *an online course aimed at unlimited participation and open access via the Internet. In addition to traditional course materials MOOCs provide forums that help build a community for students, professors, and tutors.*

POOC, Participatory Open Online Course: *a course where participants are invited to share, collaborate and create knowledge.*

SMOC, Synchronous Massive Online Course: *a course that features live, synchronous broadcasts to students.*

SPOC, Small Private Online Course: *the power of MOOCs provided for small groups of on-campus students.*

UX (User experience) design: *the process of enhancing customer satisfaction by improving the usability, ease of use, and pleasure provided by a device or application.*

virtual learning environment: *an e-learning education system based on the web that provides equivalent virtual access to classes, educational content, assessments, and various external resources.*

xMOOC: *"MOOC as eXtension of something else". These courses are modeled on traditional course materials, lectures and quiz-type assessment methods.*

Les cahiers de veille de la Fondation Télécom

The *cahier de veille de la Fondation Télécom* is the result of studies conducted jointly by Institut Mines-Télécom professors and industry experts. Each *cahier*, which deals with a specific topic, is given to researchers at the Institute who gather around them recognized experts. All at once comprehensive and concise, the *cahier de veille* offers a state of the art of the technology and an analysis of both the market and the economic and legal aspects, focusing on the most critical points. It concludes with perspectives that are all possible ways of joint working between partners of the Fondation Télécom and the Institut Mines-Télécom teams.

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