MOOCs challenges

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Outline

1. Introduction and context for discussion.
2. Traditional vs. modern learning, and on campus vs. online.
3. Technological disruption (in class/home).
4. MOOC’s features.
5. Critical areas and myths.
6. Automatic grading (assignments and quiz).
7. Conclusions.
Behind MOOC´s

Education is a complex matter. It involves teaching and learning. Therefore, as professors we need to discuss several matters, such as:

- Teaching methods,
- Pedagogical theories,
- The relevance of active learning,
- The role of face-to-face learning in the digital age, and
- The opportunity to have MOOC´s around.

Teachers and coaches: developing intellectual curiosity, the value of experimentation, taking risks, thinking outside the box, critical thinking, learn how to learn.
Education is about how to process and use information, knowledge, skills and habits.

Instruction is for communication.

* Remember Bologna Process: shift from teaching to learning (and learning environments) opening a space of opportunities and novelties.
Manifesto for active learning

- Learning is not the same thing as receiving information. It involves practice and experience.
- Lectures are not the enemy of active learning.
- Lectures should never be passive. Feedback needed.
- Technology should not be banned from the classroom.
- Humanities should never be detached from broad applicability. They are relevant even for technological courses.
- Job skills request humanities (Philosophy) education.
Higher education applications

- A combination of (use-inspired) basic and pure applied research: intelligence plus technology.
- Allow to create models for the understanding of cognition: effective learning and teaching; training, formation; focus on learning outcomes.
- Use of software agents aims to improve and personalize management, delivery, efficiency and evaluation of online courses on an individual basis.
- AIED community: http://ijaied.org/about
- Educational data mining community: www.educationaldatamining.org
Education key items

- Concepts.
- Skills.
- Problem solving.
- Professional experiences.
- Learning outcomes.
- Learning spaces.
- Technological tools: customize education platforms and personal computers to follow trends so far (e-learning, software Agents, need of feedback); intelligent tutoring systems, recommender systems, learning management systems (eg. Moodle).
Technology support

- Experimenting with technologically driven curricular pedagogies:
  - Flipped classrooms,
  - Blended learning.
- Use of video clips for demo and experimental purposes, to clarify ideas and concepts, and to show distinguished scientists and professors (talks, opinions, explanations, experiences).
- Use of video conferences to discuss subjects and confront arguments, and for homework aims (reading assignments and class preparation).
Learning analytics

Course designers, managers, tutors, participants and policy makers of institutions need data on:

- Didactic approaches.
- Student identities.
- Preferences.
- Usage profiles and access times.
- Learning styles and rates.
- Study patterns.
- Problems accessing a resource.
- Learning contents: concept understanding.
Student patterns
UNESCO aim

- The universal access to high quality education is the key to the building of peace, sustainable social and economic development, and intercultural dialogue.
- Open Educational Resources (OET) provide a strategic opportunity to improve the quality of education as well facilitate policy dialogue, knowledge sharing and capacity building.
- Unesco follows MOOCs, but the real movement started in USA.
Traditional school

- **Entanglement**: isolated teachers trying alone hypotheses with their students, in a class too crowded. No personalize interactions.
- **Status**: no information of any other experiences (or identical situations) and also about their results (no communication).
- **Teacher-centric**: more emphasis on teaching.
- **No good trade-off** between teaching and learning.
- **Students as assistants**: no live participation, not so much collaboration among them, no indirect use (evaluation of exams, tests, assignments).
Essential learning

- Personalized learning (tutors, mentors).
- Instant feedback in class. Get responses from students and from teachers on fly.
- Interactions.
- Personalized feedback after quiz and exams (facilities to be incorporated in platforms).
- Decompose subjects into small units of 15 min.
- Fast retrieval questions.
Sigma problem
Another alternative

- Open and distance universities.
- Distance learning (aids for support, demos, laboratory, face-to-face) to talks and lectures.
- Upgrade by using the Web (e-learning).
- Forum, chat, conference by Skype, Wikis, YouTube talks.
- Use of social networks for discussing and exchange of opinions (LinkedIn, Twitter, Flickr, Facebook).
New school

- Education is ability to work/think/interact with others and to access contents anytime possible.
- Open space: teachers in contact with colleagues, students and parents; good feedback around.
- Status: no enough information of other experiences (or identical situations) and the results available.
- Active learning classrooms: need to increase questioning; digital learning technology.
- Student-centric. Focus on autonomy, team work, think out-the-box, and time management.
More resources around

- New possibilities in personalized and online education create new challenges globally.
- Problem solving. Experimentation. Resources.
- MOOCs (Massive Open Online Courses) start:
  - MITs OpenCourseWare, Harvard University, UC Berkeley, University of Texas group, Duke Univ.
  - Stanford University.
  - Michigan University.
  - edX, Coursera, Udacity, Khan Academy.

MOOCs are a continuation of the trend in innovation, experimentation and the use of technology, initiated by distance and online learning to provide learning opportunities for a large numbers of learners.
**Boom**

- Founding of Coursera by Sebastian Thurn and Daphne Koller, April, 2012.
- AI Course by Thurn: 165,000, September 2012.
- Machine Learning course: 100,000 (against 400 per year in Stanford University (Andrew Ng)).
- Feb 20, 2013: 2.7 M students, 195 countries, 1.45 new courses per month.
- TED talk by Daphne Koller: 184,030 YouTube viewers (Feb 5, 2014).
March 2013

MOOCs rising

Over little more than a year, Coursera in Mountain View, California — the largest of three companies developing and hosting massive open online courses (MOOCs) — has introduced 328 different courses from 62 universities in 17 countries (left). The platform’s 2.9 million registered users come from more than 220 countries (centre). And courses span subjects as diverse as pre-calculus, equine nutrition and introductory jazz improvisation (right).

Supply and demand

Student origins

Courses offered

Number of courses available on the platform
Number of user accounts on the platform (millions)

27.7% United States
8.8% India
5.1% Brazil
4.4% United Kingdom
4% Spain
3.6% Canada
2.3% Australia
2.2% Russia
41.9% Rest of world

6% Mathematics
13% Business
30% Science
23% Information technology
28% Arts and humanities
Reasons for ongoing debate

- Hype about MOOCs in the USA press from 2011.
- MOOCs will de-skill and desintermediate faculty, compromising the quality of education and student experience.
- High non-completion rates in MOOCs offerings.
- Pressure on institutions to reduce costs, largely in response to massive withdrawal of public funds for higher education (in USA, post-secondary education in 2009 is 42% more the amount spent in 2000).
Reasons for ongoing debate

- Embrace game-changing approach in opening up their previously closed academic resources.
- Leverage the revolutionary potential of digital technology to provide access to the world’s best faculty members.
- This new method of dissemination takes what were once exclusive, limited-access, high-priced resources and puts them online for anyone to learn from, freely.
- COAPI (Coalition of Open Access Policy Institutions) comprises more than 40 universities.
MOOCs

- A web-based class environment aimed at large-scale global participation and open access via the Web.
- They allow flexible learning style where students can pick and choose which classes they take, and when and where they do their work.
- Flexibility and low cost, and the reduction of teachers need. MOOCs allow faculty to choose with whom to reach their courses, even across institutional boundaries.
MOOCs stakeholders

- Publishers and curators.
- Professors.
- Universities.
- Enterprises.
- Traditional and non/traditional students.
Disruptive technology

- Traditional versus Online Universities/Colleges
  (powered by steam versus sail ships to cross Atlantic)
- Mix of two sorts (traditional plus use of online for), one or the other one? Severe dispute about the alternatives suited for disciplines!
- Consequence so far: 1) improvements in the production and delivery of high-quality lecture material, benefitting both online and traditional on-campus courses; 2) more research and education communities on developing and evaluating scalable learning environment methods.
Disruptive technology

- Competitive threat for the status quo: traditional (and existing model) courses need to change and to face innovations required by students.

- Students face the continuous increasing of course costs and the lack of quality (poor resources, teaching styles and methods). They want to save time and money: low-cost programs with certification of skills of value to employers.

- Way outs: flipping the classroom with lectures watched from home; merger of traditional colleges with online pioneers (Laureate Education Inc.).
MOOCs features

- They have been delivered to students and the public online openly and freely.
- They don’t enforce prerequisites.
- They are better suited for highly self-motivated learners.
- Side effects:
  - Typically only 5-10% of registrants actually attain a statement of accomplishment (50-85% in traditional).
  - Students are active auditors who use MOOCs like streaming, on-demand, educational TV shows, delivered by inspiring teachers.
MOOCs for

- Well suited for Computer Science, Business, Mathematics, and unsuited for Chemistry, Biology, Physics, Architecture or Medicine.
- MOOCs for countless colleges (industries unable to change may disappear).

So, 1) MOOCs are a valuable medium for conveying certain types of knowledge; and 2) we need now to understand properly their potential and limits, against current options.
Good examples

- Model Thinking, Scott E. Page, Coursera, University of Michigan.
- Analysis of a Complex Kind, Coursera, Petra Bonfert-Taylor, Wesleyan University.
- Foundations of Multiagent Systems, Coursera, Kevin Leyton-Brown, University of British Columbia.
- Artificial Intelligence Planning, Coursera, Gerhard Wickle and Austin Tate, Edinburgh University.
- Artificial Intelligence, Edx, Daniel Klein, University of Berkeley.
Good examples

- Social Network Analysis, Coursera, Lada Adamic, University of Michigan.
- Social Psychology, Coursera, Scott Plous, Wesleyan University.
- On MOOC´s, Coursera, Daphne Koller, Darden.
- What We are Learning from Online Education, TED, Coursera, Daphne Koller, Stanford University.
- The Online Revolution: learning without limits, Coursera, Daphne Koller, Stanford University.
Media attention

- MOOCs are used now as a supplement to classroom teaching or as a replacement for it? Can they destroy universities?

- It is suitable to get a close look at how these courses are actually being used because they:
  - increase instructor leverage, student throughput, student mastery, and student engagement,
  - are also good for PhD and MSc students to improve learning of key disciplines, to facilitate coaching of concepts and tools, and to build bridges for specific knowledge, in order to use or amplify it.
MOOCs

- Less time of classroom (8-15 min.) with video lecture clips (examples in YouTube to be seen).
- 8 weeks in stead of 15.
- Yet, till 20 hours of work per week for each one.
- Students involved in the peer grading of exams (under severe constraints about precise ways of classifying). Personalized feedback also for quiz.
- Possibility of mid-term exams. More diversity of fast assignments: interactive quiz questions, multiple-answer tests, programming assignments, example running, essays, and final exams.
4 Myths on debate

- Universities will use MOOCs to lower costs by firing faculty and teaching assistants, thus sacrificing educational quality.
- MOOCs will fail because many aspects of traditional classes, such as small-group discussions and face-to-face time with instructors, do not work in the MOOC format.
- MOOCs distract faculty who should be focusing on improving their on-campus pedagogy.
- MOOCs will reduce diversity in instructors and teaching approaching because economics will favor a “winner takes all” scenario in which one specific MOOC will dominate each course.
Arguments

- From a lower-value activity to a higher-value activity.
- Access to high-quality materials and expositions.
- Rapid feedback to students via auto-grading, to maximize the leverage of the scarce resource – the instructor time.
- Replicating the classroom experience is the proper goal for an online course.
- Missing: foster learning activities as discussion-based learning and open-ended design projects!
Arguments

- Enhance classroom teaching by using inferential statistics techniques.
- Raise the bar for acceptable teaching on campus and improve the recognition of good teaching.
- Practice of lecture styles and teaching strategies which do not depend on the nature of the material and the target audience of students.
Challenges for Informatics

- Cognitive tutors. Constraint-based tutors.
- Simulators and simulation environments.
- Large collections of data about learners and their learning processes (knowledge management).
- Recommender systems, simulation-based educational software, personalized teaching systems, massive multiplayer online games, collaborative authoring, learning in context, and just-in-time learning. User interface agents.
- Learning environments to approach the effectiveness of a one-on-one human tutor.
AI agents for

- Enhance user identity verification.
- Reduce fraud and cheating during tests.
- Provide marks and feedback to students.
- Automatic grading of homework assignments.
- Self-evaluation of written work with specific guidelines.
- Limited peer interaction.
- Improve quality to education (aiding learning).
Learning outcomes

- Metrics for the assessment of knowledge, skills, attitudes and values: what was learnt by the student? What can he do? How can he be aided? How is improved the professor performance (style, representation, voice and attitude)

- Indicators of difficulties (unsettled students):
  - Stability, perserverance, discipline, commitment,
  - Skills, common sense,
  - Knowledge,
  - Motivation, intuition, insight, or
  - Direct activity.
Conclusions

- Understanding the way we think and choose, ignoring or defying conventional wisdom.
- More involvement of students (classes with less students): active and dynamic questioning.
- Student performance evolution as a way to monitor the whole system (learning metrics).
- More support for teachers.
- Use of critical and lateral thinking.
- Cartography of singularities: symptoms, therapies (pedagogies) and target results.
Conclusions

- A quest to innovate higher education resting solely on reducing time and cost dismisses the required cognitive effort and support needed to transform students’ fundamental thinking patterns.
- To develop the knowledge and skills, to function effectively as a professional or a scientist, requires quality guidance and genuine effort (hours per week).
References

Fisher, D. Warming up to MOOCs, Inside Higher Education, November 6, 2012.
Fox, A. From MOOCs to SPOCs, Supplementing the classroom experience with Small Private Online Courses (SPOCs), Comm. of the ACM, December, 2013.
Education tops

- Decline of USA and Sweden.
- New countries at the top: Finland, South Corea, Poland (PISA 2012).
- PISA Portugal increase may be temporary, due to severe cuts in education budgets, family salaries, aggregation of schools, increase of the number of students in class, suspension of building renewal, less teachers and resources.
MOOC`s critical areas

- Curricula.
- Pedagogy: use of technology.
- Lack of rigor in classroom.
- Textbooks.
- Scalability: interaction student-teacher.
- Teaching preparation.
- Lab experience: simulators (Medicine).
- Cheating: unbound.
Journals and Magazines

- IEEE Computer.
- IEEE Intelligent Systems.
- ACM Communications.
- Tomorrow’s Professor eNewsletter.
- Inside Higher Education.
- Times Higher Education.
- AI Magazine.
- TED.com and YouTube.
- The New Yorker.
Corporate universities

- Renewing (training) of skills and knowledge.
- e-Learning platforms (MiríadaX, Veduca).
- Social nets (Facebook, LinkedIn)+Blogs+Wikis = MOOCs
- Personalized education (free, open, non-paid).
- Use of coaching.
- B-Learning.
- 70% of learning is acquired in work contexts.
- Technology (laptops, tablets, smartphones): mobile leaning, Agile e-Learning, game-based.
- Portugal players: PwS, Novabase, IFB.
Problem driven research

- Classical trail: from Educational problems to AIED or ITS systems, AI theories, Tools, and Techniques, Models of human cognition, affect, and motivation.
- A synergistic two-way relationship holds between AIED and Research in human cognition with AI.
- What about new alleys: different students learn at different speeds?
- There is now a need for continual training at school, college and university.
Enhancing learning

- Ambient Intelligence for Education
  - Environments: e-Learning, Web-based, Social nets.
  - Collaborative environments: peers, coaches, tutors.
  - Resources.

- What was done before: student profile (background knowledge), results so far, new goals, tools, methods and learning/teaching strategies, assessments (performance and scores).

- Next: from Isolation toward Distribution.
Online resources

- EAAI Website: eaai.cs.mtu.edu
- AI and education mailing list: lists.wiki.com/listsinfo.cgi/ai-ed-wikiri.com
- Coursera: www.coursera.org
- edX: www.edx.org
- Udacity: www.udacity.com
- MOOC provider list: www.moocs.com/Higher_Education_Moocs.html
- MOOC courselists: www.mooc.list.com
More MOOC’s

- Dynamics System Modeling, on Markov Models by Paul Fishwick.