What can Residential, Research-Based Universities Learn about their Core Competencies from MOOCs (Massive Open Online Courses)?

Gerhard Fischer[1] and Karsten D. Wolf[2]

[1]University of Colorado, Boulder, USA

[2]University Bremen, Germany

After the peak

Learning is the central activity of the 21st century. It needs to be reconceptualized, nurtured, and supported to meet numerous intellectual and economic challenges by taking advantage of transformative theoretical frameworks, innovative technologies, and social practices.

Over the past five years Massive Open Online Courses (MOOCs) have ignited the imagination of venture capitalists, politicians, non-traditional students and the public more than most other e-learning trends for the past decades. There have been not only hopes to „bring top-notch courses to the world's poorest citizens and reshaping the way all students learn"[1] but even promises to provide world class education to a billion people (edX announcement May 2, 2012[2]).

These inflated expectations have given room to disillusion as soon as people realized that quality education still comes at a price, that providing access does not mean automatic academic success, and that there is no total disruption of the higher education system yet. Increasingly critical analysis of MOOCs show that *"the absence of serious pedagogy in MOOCs is rather striking, their essential feature being short, unsophisticated video chunks, interleaved with online quizzes, and accompanied by social networking"* (Vardi, 2012).

Still, the MOOC movement is expected to move fast onto a somewhat reduced plateau of productivity and it would be a great mistake to dismiss MOOCs as a fad. We believe that analyzing the promise, the failing and the potential of today's MOOCs helps us to develop a refreshed understanding of the core competencies of residential, research-based universities.

The Promise

Depending on whom one asks, MOOCs are a variety of e-learning formats spanning from programmed instruction to self-organized learning networks. So what does naming an online course a MOOC imply?

Massive: The description *Massive* has been derived from Massive Multiplayer Online Roleplaying Games (MMORPG) such as World of Warcraft. *Massive* means that a large number of users can participate in a course. Not necessarily 100,000 users such as in one of the first truly massive MOOCs "Introduction to Artificial Intelligence", but cer-

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[1] http://www.scientificamerican.com/editorial/digital-education/
[2] See the screencast of the press conference at http://newsoffice.mit.edu/2012/mit-harvard-edx-announcement-050212.

tainly larger than your average seminar or lecture. *Massive* therefore is a *relative* term that hints on the *scalability* of the MOOC format.

Open: While the meaning of *Massive* is mostly agreed upon, *Open* can mean a lot of things (Wolf, 2011):

- *open as in public* means that everyone can look into a MOOC to see what is going on there;

- *open as in without barriers* means that everyone can participate without having a formal qualification or degree;

- *open as in* free means that there are no fees to pay[3];

- *open as in libre or open to reuse, redistribute, revise and remix* (4 R's by David Wiley) means that everyone can take the contents and build upon them.

Most of today's MOOCs are not open in all senses described above but are (only) open to all people with a web browser capable of reading and writing English regardless of university entrance certificats or qualifications. A special form of MOOCs, so called connectivist MOOCs or cMOOCs for short, are open in all above described meanings, but these experimental and participatory formats have been marginalized by mainstream xMOOCs, instructionist online courses.

Online means that MOOCs do not require any physical presence at a residential university, they are truly virtual and can be accessed from any place on earth with a decent internet connection. COURSES mean, that they follow a rather linear structure with a given timetable, curricula and tasks[4].

All of this does not sound too unfamiliar to people doing E-Learning courses in the last 20 years or even to people doing Open Distance Education for the past 40 years. We had Open Universities and later Open Educational Resources, we had didactically more interesting concepts such as cMOOCs, so why the excitement?

In our opinion there are six strong cases for MOOCs:

(1) *Scalability*: xMOOCs such as the Stanford AI MOOC have proved, that they can scale up to 100,000s of users. This is a factor of 100x to even large lectures, and 1000x-5000x to traditional seminars. This opens up the phantasy of venture capitalists: MOOCs could be a solution to the century old problem to scale education; the leverage and therefore the resulting profits could be huge.

(2) *Focus on STEM contents, vocational training and practical skills*: There is a growing concern about the low performance of students in STEM fields of study, and every new way to provide more access are welcome. These contents

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[3] Most commercial MOOC providers such as Udacity or Coursera offer a Freemium model, meaning that further services are offered for a fee: qualified feedback, richer learning experiences, proctored assessments, or certification cost money. Also MOOC participants often „pay" with personal data, such as usage patterns, email adresses or even their CVs, sold to potential employers or publishers.

[4] There are some deviations of this format. So called „self-paced courses" allow students to work through the courses independently of a fixed timeplan and co-learners. For example, most courses on Udacity are self-paced.

lend themselves to the MOOC experience, because they are – at least at under-graduate level – more easily tested automatically.

(3) *Dissatisfaction with the costs and benefits college education*: critiques at the gatekeeper function of ivy league universities range from empirical analysis from CAE's president Roger Benjamin (2014) to outright hostility by self-made billion-aires trying to open new education paths for gifted persons outside of the edu-cational establishment. Politicians for public universities (or fund raisers for pri-vates ones) will welcome any change that will reduce the financial commitments needed by universities. Even from inside, university administrators will similarly welcome cost savings, are very concerned not be left behind and strive to un-derstand the impact of these developments on their own institutions (Lucas, 2014). Also parents (in most cases paying substantial amounts of money for the children's education) are interested to find out whether their children can get the same quality education for a fraction of the money that they have to pay for a conventional university education.

(4) *Good enough*: while MOOCs may not rival the offerings of top residential, re-search-based universities, they may be good enough to replace mediocre teaching offerings from sub-standard colleges. *As a recent example, Georgia Tech together with Udacity and AT&T start to offer a MOOC-based master's de-gree in Computer Science priced below $ 7,000 focused on providing a low-cost tertiary education with a high chance of landing a job afterwards[5]. This course marks an attempt to realize the tantalizing promise of the MOOC movement de-scribed in the four arguments above: a good-enough education with high poten-tial for employment, scaled up to the point where it can be delivered for a rock-bottom price.*

(5) *Branding*: But why would international top universities such as Harvard or MIT offer free or low cost courses? Prior Open Courseware projects such as MIT OCW proved that top (branded) universities giving away digital goods for free (courseware) only strengthened their brand and drove up demand for scarce, non-virtual, residential teaching. In stark difference to the music industry, rec-orded performance is NOT the central asset of residential universities (see anal-ysis below). By building upon an already strong brand, the top universities main-tain their brand perception in the virtual realm. The real business model for top universities' MOOC offerings seems to be brand building.

(6) *Philanthropy*: In the US, there is a long tradition of philanthropy especially in the field of education. MOOCs seem to be a very good way to reach the unreacha-ble, to scale (see above) and make quality education available for free to under-privileged non-traditional students.

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[5] https://www.udacity.com/georgia-tech

All of these points are true to some extent and will strengthen the role of MOOCs in the coming decade when and if they can sustain a business model or other sources of financing. But from the point of top research-based, residential universities, MOOCs are neither truly disruptive to their research-based core (MOOCs don't touch research in any meaningful way) nor very innovative for their own development of university teaching apart from scaling teaching. MOOCs have even strengthened the value of brick and mortar real space of top of the line residential universities by making the difference between the virtual and the real even more obvious. By watching lectures such as Michael Sandel's Justice course (http://www.justiceharvard.org), MOOC students get a virtual glimpse of the experience to „be there", building up a longing to become part of the „below 5%-admission experience".

Rich Landscapes for Learning

Nevertheless research-based residential universities can gain substantial insights from MOOCs by analyzing them as one component of a rich landscape for learning [Fischer, 2014a]. In doing so, MOOCs serve as a forcing function to identify and reflect on the core competencies of residential, research-based universities (such as CU Boulder or University of Bremen) in nurturing and supporting aspects of learning that cannot be easily addressed by MOOCs. What has been missed by MOOCs and what could be truly disruptive or at least changing universities?

The argumentation is grounded in research activities, practices, experiences, and beliefs that focus *"to create socio-technical environments in which people want to learn rather than have to learn"*.

These perspectives have been influenced by a variety of different philosophies and visions of learning including:

- Dewey's and Bruner's [Bruner, 1996] notion that students should be *actively engaged participants* in learning, sharing their knowledge with each other rather than competing to get good grades;
- Illich's *Learning Webs* (articulated 25 years before the Internet came into mainstream existence [Illich, 1971]) representing an early vision based on two objectives: (1) provide all who want to learn with access to available resources at any time in their lives; and (2) empower all who want to share what they know to find those who want to learn it from them;
- Thomas and Brown's *New cultures of learning* [Thomas/Brown 2011] setting up the post-community analysis of mediated learning collectives (Wolf/Breiter 2014), explaining how public learning processes create new collaborative learning environments build upon geeking out (Ito 2011) and long tail participation.

Today learning needs and learning objectives vary greatly requiring rich landscapes for learning. Figure 1 provides an overview and establishes frames of references for the future sections of this paper. It illustrates:

- Formal learning in schools needs to be complemented by informal learning.
- "Knowledge in the head" needs to be complemented with "knowledge in the world," emphasizing the importance of distributed cognition.
- Supply-oriented models (in which learners are presented with knowledge that later may become relevant for them) need to be complemented by learning on demand.
- Consumer-oriented cultures need to be complemented by participatory cultures;
- "Learning about" needs to be complemented by "learning to be".

- "Learning when the answer is known" needs to be complemented by "learning when the answer is not known" (and exploring problems that have no answers).

These objectives represent *antinomies* [Bruner, 1996]: pairs of truth, each worthwhile to pursue in different contexts, but also contradicting each other at a certain level. It is important to note that these different dimensions are not independent from each other but overlap in numerous ways. These antinomies present a wholeness which in our believe is not addressed in MOOCs, but are an element of the *Bildungsort* – a rich landscape for learning - residential, research-based universities should strive to be.
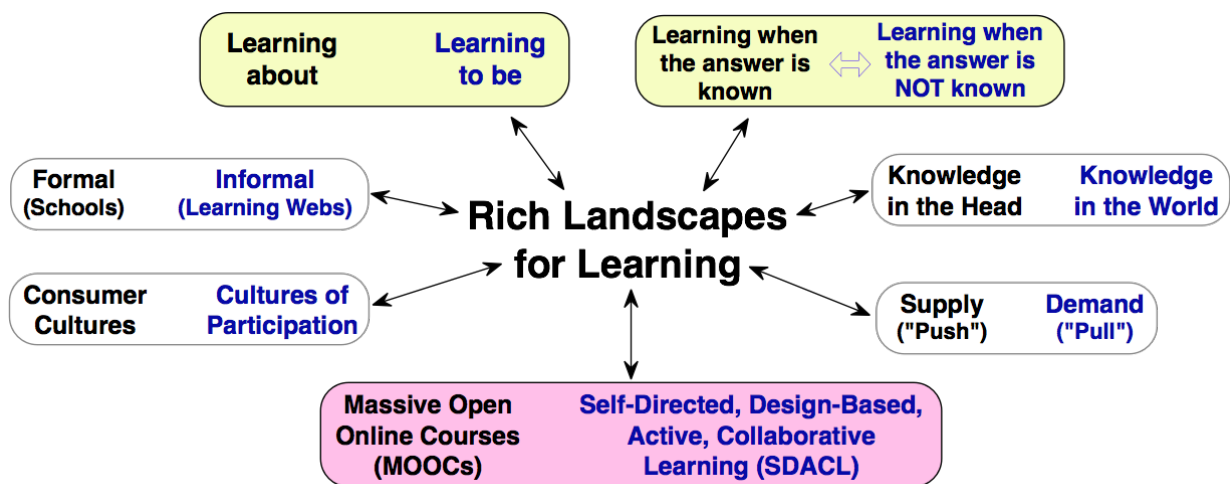

Figure 1: Overview of Rich Landscapes for Learning

Learning About versus Learning to Be

Learning about, as an objective for learning and education, is focused on the accumulation of intellectual capital realized in a curriculum that stresses the communication of culturally central theories, facts, and skills. This curriculum is identifiable and structured as a coherent and fine-grained sequence of educational objectives. Instructionist approaches can be effective for "learning about" (e.g., learners getting introduced to domains of knowledge that are new to them, e.g., Math 101, Physics 101, Design 101, etc.), although motivational issues may arise (Jang/Reeve/Deci 2010).

Learning to be (Brown, 2005) is focused not as much on teaching about mathematics, physics, or design, as on what it means and takes to be a mathematician, a physicist, or a designer (or a "Wikipedian," a skier, or a surfer). Important dimensions of *learning to be* include learning by being engaged in personally meaningful problems, teachers engaging in problem-solving activities in front of their students rather than lecturing, and enculturation into communities of practice with legitimate peripheral participation. To promote and support "learning to be", the Center for Lifelong Learning & Design (L3D) has (1) initiated and supported an *"Undergraduate Research Apprenticeship Program"* supported in large part by NSF REU grants (http://l3d.cs.colorado.edu/urap/) and (2) established and nurtured communities based on *"horizontal and vertical integration"* (bringing together individuals coming from different disciplines and including undergraduates, graduates, post-docs, faculty members, and people in industry). The

University of Bremen has implemented a institution wide program for research-based learning in undergraduate studies[6].

Learning "When the Answer is Known" versus "Learning When the Answer is Not Known"

In many introductory courses (particularly in disciplines belonging to the natural sciences (Simon, 1996) such as mathematics and physics), the answer to the problems discussed in courses exists and is known by the teacher, and the core challenge is *"for learners to learn what the teacher knows"*. But in many other situations (e.g., exploring wicked, ill-defined design problems), the answer is not known by any stakeholder; instead, all participants engage in collaborative knowledge construction and evaluation processes. In many of these problem-solving situations, a correct, final "answer" does not exist (e.g., the antinomies indicated in Figure 1).

In settings where *the answer is known by the teacher and not by the learner,* instructionism and lectures based on the transmission model are reasonable and cost-effective strategies. The emphasis is on transmitting "subject matter" to pass on the memes to the next generation [Csikszentmihalyi, 1996]. Under which conditions it is the best way to achieve learning by the learners is not ultimately decided. Theorists like Bruner argue that the most important gift of cultural psychology to education is the reformulation of the impoverished conception that *"teaching is fitted into a mold in which a single, presumably omniscient teacher explicitly tells or shows presumably unknowing learners something they presumably know nothing about" (*Bruner, 1996:20).

In settings where *the answer is not known and the "right" answer may not exist (*as it is the case in wicked, ill-defined design problems), learning is not a commodity to be consumed but is collaboratively designed and constructed, emphasizing innovation, continuous learning, and collaboration as important processes in which workers as stakeholders create new knowledge as they carry out their problem framing and problem solving activities. The role of the omniscient teacher does not exist in such settings*: "In important transformations of our personal lives and organizational practices, we must learn new forms of activity which are not there yet. They are literally learned as they are being created. There is no competent teacher. Standard learning theories have little to offer if one wants to understand these processes."* (Engeström, 2001:138).

As soon as one starts to integrate real research questions into teaching, answers are not known. Research-based teaching as in „students undertaking research and inquiry" (Healey 2005) therefore *always* imply learning when the answer is not known.

Core Competencies of Residential, Research-Based Universities

So what are core competencies of residential, research-based universities which set's them apart from being just highly efficient "learning about" instructional automata?

Here is one opinion about this by Friedman [Friedman, 2013]: *"There is still huge value in the residential college experience and the teacher-student and student-student interactions it facilitates. But to thrive, universities will have to nurture even more of those unique experiences while blending in technology to improve education outcomes in measurable ways at lower costs. We still need more research on what works, but standing still is not an option."*

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[6] http://www.uni-bremen.de/forsta.html

This section will identify and analyze some of these core competencies (CCs).

CC-1: Allowing and motivating learners to engage in authentic, self-directed learning activities — this freedom to choose by the learners should be integrated with the guidance that (1) important topics should be presented, (2) a curriculum should provide coherence for all the material to be learned, and (3) a syllabus for a course should be structured to help learners to orient themselves (Fischer, 2014b).

CC-2: Supporting Active Knowledge Construction. Lecture-dominated courses often emphasize passive knowledge absorption and serve as the "reproductive organ of a consumer society" (Illich, 1971). Educational institutions should fight this trend by cultivating "designers" by creating mindsets and habits that help people to become empowered and willing to actively contribute to the design of their lives and communities (Fischer, 2011).

CC-3: Fostering Enculturation. Learning about a discipline is different from become a member of a discipline. This distinction is emphasized by our differentiation between "learning about" and "learning-to-be". It provides the main rationale for University of Boulder's Undergraduate Research Apprenticeship Program.

CC-4: Framing Problems. Students should have opportunities not only with solving problems, but how to frame problems. To do so, they must have engaged with problems for which they have some ownership.

CC-5: Coping with wicked, ill-defined problems. Most problems encountered by learners in schools and universities have right or wrong answers (e.g.: in mathematics, physics, and the natural science in general and in most MOOCs) and the students expect that the instructor knows the answer to these problems.

CC-6: Grounding learning in a distributed cognition perspective. Our students will live in a world in which pervasive, mobile computing, always-on and reliable Internet access and everything is connected (Internet of things). While a sufficient level of digital literacy for everyday life can be assumed to exist, digital research literacy has to be explored with students. Most cognitive activities in people's life outside of schools are intimately intertwined with cognitive tools whereas in school, many activities (e.g.: remembering facts, closed book exams) are taught and examined for the unaided mind and our scientific understanding is focused on memory, attention, perception, action, and thought, unaided by external devices.

CC-7: Emphasizing collaborative learning and communication skills. The power of the unaided individual mind is highly overrated. Although society often thinks of creative individuals as working in isolation, intelligence and creativity result in large part from interaction and collaboration with other individuals. Learning environments in which working together is regarded as cheating will not promote a mindset among leaners to appreciate and exercise collaborative activities which are essential for "learning when the answer is not known".

CC-8: Giving Degrees. Brown and Duguid (Brown & Duguid, 2000:214) argue that one of the university's core competency is to give degrees aka trusted certificates. One of the major unresolved issues for MOOCs is how to provide certificates that are valued at a lower cost level.

CC-9: Creating lifelong relationships between institutions and learners. One of the fundamental objectives that universities can establish is to use the four or more years that students spend on campus to establish a lifelong relationship. This relationship

should not be reduced to alumni who give occasionally money to universities but should include intellectual relationships in which working people can engage in lifelong learning activities and students can learn from the experience of the people out in the world.

CC-10: Fostering Geeking Out: One of the main opportunities of spending time at a research-based university is the chance to dive deeply into a topic or interest and attain expertise above curricula expectations and faculty competences in an albeit small field, setting up competences for live long self-determined expertise building.

Lessons to be Learned from MOOCs

All too often the reaction to MOOCs in academia has either to banalize its innovative aspects (which we did not do) or to focus on one own's strengths (which we did). But MOOCs can also be viewed as a place of social innovation, spanning from connectivist cMOOCs to instructionist xMOOCs. They have tremendous potential for the further development of residential research-based universities as rich learning landscapes:

LL-1: True openness and collaborative production of Open Educational Resources. To realize the potential of MOOCs they have to be understood and be usable as Open Educational Resources (OER). If they were truly free for reuses (see above), parts of them could be used flexible to enhance teaching: resources for self-studying and geeking out, building blocks for course-mashups, or inputs for inverted classrooms. They also could serve as a test bed for new courses and provide a production platform for collaboration between institutions and colleagues.

LL-2: Bottom up didactical innovations. MOOCs open up new ways to try out things precisely because they are not locked into specific curricula. Teachers can try out new ideas, but also students are free to innovate their peer learning strategies. If MOOC platforms would be open for integration of other web tools, they could form didactical sandboxes for innovating E-learning at large. Because teaching a class in a residential university with more than 150 students is often not fundamentally different from a MOOC (even if clickers as student response systems are used to make a class slightly more interactive), innovations in MOOC based large group teaching methods can also be fed backward into residential teaching.

LL-3: The right to create your own curricula. Residential universities can only supply a limited set of courses. Either faculty is busy teaching other courses or at one university there are not enough students to be interested into a certain topic. MOOCs open up ways to follow one's own interests and intellectual curiosity across institutions, and to run cross-institutional courses. It is unclear yet if this results into a new age of *Bildung* or if it poses death not only for standardized curricula but for professions, too.

LL-4: Academic level geeking out zones and intellectual raid instances. A special kind of MOOC we call ROOCs (Research Oriented Online Courses) – currently under development at University Bremen – tries to develop research-based learning environments for cultivating intellectual communities of research. One thing to be learned from MMORPG is how to allow self-paced deep learning in ill-defined complex problem spaces combined with peer-based, synchronous "raids" to tackle hard problems for learning (*intellectual raid instances*) (Wolf 2012).

Conclusions

All of this places high demands on the motivation and self-regulated learning skills of students, but also on the media savvyness of teaching researchers. These skills have

to be developed to reap the benefits of blended approaches integrating MOOCs into residential teaching.

Lots of experimentation will be needed to integrate online education to enrich residential education. The future of learning and education is not out there to be discovered (as Columbus discovered America) — but it has to be *designed*. While economic and technological perspectives are important dimensions, a learning science perspective is needed to determine the vision to be pursued, the questions to be asked, and the frames of reference to be established.

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