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Understanding MOOCs Through Connectivist and Social Constructivist Approaches

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Abstract: During only a few years, MOOCs have been widespread adopted and accepted as part of the educational agenda. The massive aspect, the social networking, and the idea of new student roles where the student is the main responsible for self-organizing her or his participation are main drivers in the learning processes. The current development of MOOCs can be seen as having two distinct directions; cMOOCs, defined by a participative pedagogical model based on the principles of connectivism, which is introduced as a new learning theory; and xMOOCs, developed as extensions of traditional courses, and to a higher degree based on an instructional model. However, as MOOCs have spread globally and developed, this dichotomy is no longer sufficient. From a mapping of UK MOOCs, Bayne and Ross suggest that the emergence of MOOCs gives rise to discussions of central pedagogical questions of What, How and Whom, which are well-known and not yet solved issues in e-learning (Bayne and Ross, 2013, p. 8). We therefore wish to discuss MOOCs from more multiple perspectives and raise issues which emerge from the current reports on practices with MOOCs. A social constructivist perspective on learning acknowledges both the participatory approach to learning and the role of the teacher as an important moderator of students' learning processes. Using this as a pedagogical model for a large scale programme like MOOC is of course challenging. A recent study on students' interaction and collaboration shows that the large scale make students search for other students with whom they share goals, and suggests that scaffolding activities of the teacher may be practiced by adding supportive posts with important learning patterns (Andersen et al, 2014). The scaffolding learning activities (Vygotsky, 1986) based on a culture of discussion and critical thinking draw on insights from the field of it-didactic design, with an emphasis on the students' own design of their learning processes. In a large scale programme, where moderating activities may be distributed to assisting students/teachers, the didactic competence among students may draw on the technologies of connectivity in combination with the pedagogy of social constructivism, where instructions and discussions provide new patterns for understanding.

Keywords: teacher roles, knowledge domains, massive open online courses, connectivism, social constructivism

1. Introduction

MOOC has become a popular new model for education inside and outside educational institutions. MOOCs – Massive Open Online Courses – make a promise of free and accessible education for all people. Different MOOC models are tested in different parts of the world and have given rise to great expectations for its future impact on education.

Being university educators, our interests concern the potentials as well as the challenges of this model for online learning. Our theoretical discussions emerged from an Asian-European collaborative project in which we are involved, that maps national MOOC initiatives in the participating countries (Jung and Kim, 2015). The mapping revealed knowledge of MOOC on a general level concerning the political interest and the technical readiness. Less attention concerned the implications for pedagogical practices in MOOC. However, the report from the project indicates the need to focus on issues concerning pedagogical aspects of MOOCs as a many-faceted complex of pedagogical philosophy, learning theories and learning cultures.

In this paper we focus on the teacher role and discipline-informed knowledge domains as two areas where MOOC initiates a shift in pedagogical thinking and pose challenges to theories of learning.

2. The development of the MOOC phenomenon

The vast growth of MOOCs in numbers, which we have witnessed during only a few years, is a new phenomenon and builds at the same time on a history of online learning. The term itself, 'massive open online course', was invented in 2007 by Dave Cormier and Bryan Alexander as a way of describing a specific open online course, which was led by George Siemens and Stephen Downes at the University of Manitoba, where 25 students on campus studied along with 2300 online students who had free and open access to the course activities. All course content was freely available; the participants could use their own choice of tools, which could be asynchronous discussion fora, blog posts, Second Life, or synchronous online meetings (Daniel, 2012).

This intention of open online learning for everyone was not new, but the way of opening up a traditional university course gave resonance and growing public interest. A few years later, McAuley, Stewart, Siemens and Cormier defined the main characteristics of a MOOC:

“a MOOC integrates the connectivity of social networking, the facilitation of an acknowledged expert in a field of study, and a collection of freely accessible online resources. Perhaps most importantly, however, a MOOC builds on the active engagement of several hundred to several thousand “students” who self-organize their participation according to learning goals, prior knowledge and skills, and common interests. Although it may share in some of the conventions of an ordinary course, such as a predefined timeline and weekly topics for consideration, a MOOC generally carries no fees, no prerequisites other than Internet access and interest, no predefined expectations for participation, and no formal accreditation.” (McAuley et al, 2010, p. 4)

McAuley et al emphasize the free approach in every sense: everyone who wants may participate; they may do it as much and in which way they want; and they may unfold their activity anywhere they want, at the original MOOC site, in own blogs, Twitter or other online groups.

The pedagogic approach of the early MOOCs was to a large extent based on a philosophy of connectivism and networking, leading to a participative pedagogical model with an emphasis on interaction between the participants at the course (Daniels, 2012; Rodriguez, 2012). This tradition has been labelled cMOOCs, which as a concept is understood in opposition to the later development of MOOCs, called xMOOCs, which covers courses offered by large educational institutions as an extension of their area, often building on a more behaviourist approach with resources, quizzes and tests. The first of these xMOOCs, an open course on artificial intelligence (AI), which attracted 160,000 registered students, were offered only four years ago in 2011 by Stanford University (Rodriguez, 2012). Since then a worldwide chorus of established universities have jumped on the wagon and are offering MOOCs in a variety of areas. Participation in the courses is free, however there might be a fee to receive a certificate for completing the course, which is one of the way universities are exploring ways of making their effort economically sustainable.

The public interest in the MOOC phenomenon has mainly been developed in the wake of the almost explosive current growth of xMOOCs through established universities worldwide offering free and openly available courses. The difference in pedagogy between cMOOCs and xMOOCs has been so distinct that it might be seen as confusing to treat them by the same term (Daniels, 2012). However, the behaviourist approaches have developed, incorporating elements of participation or interaction, and MOOCs are today not only two types, but as discussed later builds on a hybrid of different pedagogical approaches. Where will the development of MOOCs go? And which theoretical foundations may help us understand the questions that arise through the educational practice of MOOCs?

3. Connectivist and social constructivist perspectives on learning

The early MOOCs were related to an emerging theory of connectivism, and we will discuss what this approach may add in relation to a social constructivist perspective on learning.

3.1 What can we learn from connectivism?

Almost coinciding with the emergence of MOOCs, the paradigm of connectivism has been introduced as a new learning theory (Siemens, 2005). The close connection between the two is emphasized by the fact that Siemens and Downes' first MOOC, entitled “Connectivism and connective knowledge”, was an exploration of the connectivist perspective (Daniels, 2012).

In his approach, Siemens claims that the three general theories of learning – behaviourism, cognitivism, and constructivism – were all “developed in a time when learning was not impacted through technology” (Siemens, 2005), and he suggests connectivism as an entirely new approach. While the three theories admittedly were developed before the www, we will however point out that they certainly dealt with various aspects of technologies. To claim that connectivism should be a new general learning theory is a demanding claim.

Siemens criticizes existing learning theories to be inadequate for the digital age. He proposes connectivism as an alternative contemporary approach to understand the late modern community, where experiences to a large extent are mediated, and knowledge does rather generate in complex and random occurrences than in linear

and logic processes. He draws on theories of chaos, network, complexity and self-organization. Digital technology is metaphorically equated with the brain as a neural network and based on the insights from the neuro sciences. The general idea is that knowledge is not of a static nature but is rapidly changing in processes of continuing learning. Thereby, learning becomes a sort of managing of accessible information (Siemens, 2005).

When connectivism is transformed to learning principles for a MOOC, the focus will be on the activities of the learner, and the learner's activities will be the main driver for the learning process, as is also apparent in McAuley et al's definition above. The learner will be responsible for sharing and discussing information, ideas and knowledge with colleague learners.

The Scandinavian orientation towards a social constructivist approach to learning acknowledges both the social and participatory perspectives on learning, but is more occupied with the role of the teacher as an important moderator of the students' learning processes. The activity theories (Vygotsky, 1986) of learning play an important role in the planning and moderation of students' learning activities. The organization in problem-based projects is based on the idea that knowledge is constructed in the meeting between the learner and the learning content and is processed through real life problems which become object for investigation and discussion (Andreassen and Nielsen, 2013). Students' ability to ask questions, to reflect on them, and direct their investigation is crucial to the process. The learning approach is based on a culture for discussion and critical thinking; in this respect the connectivist and constructivist perspectives can be said to have a joint focus. In this approach the final assessment measures the learner's competence in identifying and analyzing problems from a theory-based and problem-solving approach and to explain the criteria for choices and decisions.

What is seen in the currents of the pedagogical models of cMOOC and xMOOC respectively is a basic difference between ideas of how learning happens. When discussed, it easily comes to a 'pro et con' (for or against). However, the practice of designing pedagogical models for a MOOC may be more nuanced. The worldwide vision of online courses for everyone implies considerations of the learning content as well as the learning cultures of every enrolling student. There is no worldwide consensus of pedagogical models and if your experience with schooling is learning by repeating your teachers' input, a connectivist MOOC assignment will become an insurmountable barrier to overcome. Skills for participation and social learning activities take time to achieve. Another challenge is the knowledge domain in the programme of a particular MOOC. Are all knowledge domains suitable for one or the other pedagogy?

The target groups of a specific course may have learning cultures that guide them in the direction of one learning approach while the goal, the content and pedagogies are based on designs that may take another direction. This issue is not unique to MOOCs, but it is exposed when worldwide large scale models like MOOCs are chosen, and it represents basic questions from many years of educational science and research and are actualized by the increasing implementation of it-based education.

4. Pedagogical models of MOOC

MOOC programmes are developing fast. According to Bayne and Ross' (2013) report from the UK, MOOCs have multiple forms and the binary of cMOOCs and xMOOCs are no longer representative or particularly useful. Bayne and Ross find that MOOC pedagogy is not embedded in the specific MOOC platforms, and they suggest more attention to socio-material and discipline-informed issues. Bayne and Ross hereby address issues which cannot be solved by general pedagogical ideas from either the 'x' or 'c'. The 'x' perspective may suggest an approach that supports and controls content distributed for individuals, and thereby intends to promote learning processes in the meaning of change of cognitive capacity. Assessment tools like quizzes and questionnaire may test the learners' capacity to take a test. But the approach is not capable of assessing the generation of new knowledge.

The 'x' approach utilizes the MOOC platform's technological capacity for distribution to a large scale audience and supports learning activities which are controlled by a teacher or a program. The stimulus-response paradigm for how learning proceeds is the obvious logic behind this. The criticism of the 'x' approach is not new (cf. above), rather the application of behaviourist learning theory to a new technological platform resumes an old discussion relevant also in relation to the last twenty years development of online learning approaches.

The 'c' perspective suggests an approach where distributors (individuals or systems) process information from an open resource of accessible information which may be discussed and reframed by the individuals participating. The approach opens for possibilities which place the responsibility on the individuals' or the system's capacity to make choices, and on the discussion group to validate their arguments (Siemens, 2005). By focusing on sharing and discussing, issues connected to domain specific content and methods are a matter for negotiation among the individuals rather than an issue for a teacher-learner relationship. The question is, however, how the creation of a network for connection of information can be perceived as learning?

Siemens (2005) suggests connectivism to be the model for definition of learning as *actionable knowledge*, which can reside outside the individual in an organization or a database. He suggests an important aspect of mediated information which is characterized by what he refers to as recognizing chaos to be the connection of everything to everything followed by principles of self-organization which is known from e.g. systems theory. We find that insights from chaos theory may produce valuable perspectives to the field of pedagogy and learning. For instance, it suggests a strategy to look at the external activities of organizing and categorizing information performed in learning situations as valuable actions. The question is whether these actions are learning or simply organization of information? If they are a process of information organization; how does this process count for learning? In the categorization process, knowledge appears as information, but how does it become knowledge?

Connectivism is suggested to be an overall, new grand theory for learning (Siemens 2005). Maybe this effort undermines the very idea of connectivist activities? If connectivism claims to facilitate constructions of networks of knowledge, the theoretical perspective should perhaps rather be a multiple, pragmatic change of positions. Connecting information or even knowledge entities require not only knowhow; it requires knowledge as well as criteria for making choices. Keith Brennan (2013) expresses it pragmatically like a gap: to learn in a cMOOC you need to connect; to connect you need to learn. So what bridges this gap?

Bayne and Ross (2013) conclude that even though many of the teaching functions are often run through automated processes or through processes of community-based social learning, the place and visibility of the teacher is still of great importance.

4.1 Teacher roles

The teacher role in a large scale e-learning programme seems to struggle with the same issues as the first distance learning courses in which the pedagogy was criticized for being behaviouristic and drawing on an approach of instructional technology framed by specified learning objectives which were classified and framed the learner's progression towards assessment (Tyler, 1949).

The Danish tradition of didactics for e-learning in the humanities took another path towards a critical and constructivist pedagogy which emphasized the activities of the learners as drivers in achieving new knowledge. The approach drew on Vygotsky's ideas of how to construct new knowledge based on what is already known and from participating in a sociocultural context (Vygotsky, 1986). Further developments suggesting that knowledge is situated in settings where they are used (Lave & Wenger, 1991) contextualised the learning process even more and gave rise to the pedagogical model of problem based learning (PBL) in which students' activities are driven by and oriented towards learning through dealing with real life problems. The teacher role was redefined from the central initiator of learning activities towards a central moderator and facilitator of learning activities (Andreassen and Nielsen, 2013). The role of the teacher is of a moderating nature rather than a facilitator. As moderator the teacher takes an active part in discussions with groups of learners and the learners are responsible of moving the process of investigation forward. Feedback from peers, theoretical contributions from the teacher and a pedagogical framing of the process to scaffold the learner's activities are crucial drivers to forward the process.

Both instructional and constructivist approaches to learning acknowledge the relationship between teacher and learner being driven by intentional change. The professionalism of the teacher is crucial for progressing the change. The teacher works in different relational areas of professionalism: the organizing and planning area in advance of a class, the situated practice where the 'relational learningship' is established between teacher, students and content, and the evaluation area, where the process is reflected with regard to improvement and new questions.

This relationship is challenged by MOOCs because of digital technologies' ability to disseminate information to a big number of learners. The number of learners makes it impossible to achieve a relational learningship between learners and teachers. Connectivism suggests this problem solved by cutting off the interdependency between the three classical actors (in Herbart's didactic theory of three partners in a teaching-learning process): teacher, learner, and content.

While other learning scientists suggests still more complex versions of this interdependency to understand new learning paths (Anderson, 2008b), the connectivism suggests changing the paradigm on which learning is understood to be actionable knowledge. Actionable knowledge is facilitated by what Downes (2006) defines as the *modeler and demonstrator* and the learners as *practicians and reflectors*. Is the modeler and demonstrator a sufficient role description for the teacher? Does that mean that learning means change of capacity or that learning means process of actions?

In connectivism the teacher role is no longer intentional or negotiating. The teacher role is instrumental and may as well be represented by a program as by a person. The connectivist teacher role is unreceptive to change from participating in the 'relational learningship' with students and content, because he/she/it is not participating in the processes. This indicates a new development in the history of the teacher role, which is very different from ideals of the Socratic dialogue. The Socratic dialogue made the teacher take the learner's position to scaffold the process of learning by asking questions. By retreating from front stage as a dialogue partner to back-stage position as a coach, a renewal of Socratic dialogue may be taken, but the large scale of posting comments on MOOC may be seen as far from being a dialogue. Entering into dialogue can be seen as an exchange with other perspectives, and a dialogic learning environment may be developed through asymmetry and difference, rather than through consensus. With differences, more voices come into play, and learning may occur through relating to different perspectives (Andreassen and Nielsen, 2013). Wegerif argue that a dialogic approach may not only be considered a means for participants to reach a goal, but may actually be considered an end in itself, since people through engaging in dialogic processes become able to construct knowledge and develop reflective thinking (Wegerif, 2013).

The role of the teacher was until the emergence of digital networked learning defined by the didactic professionalism of planning, practicing and reflecting the teaching process (Dale, 1989). Different ideas, mainly from German philosophy of formation (the concept of *Bildung*) inspired the didactic professionalism of either emphasis on what content should be taught or emphasis on what capacity should be processed (Klafki, 1985). Klafki suggested a selection principle for fundamental and elementary knowledge that should meet an increasing challenge from still more available knowledge. Klafki suggested that the teacher should be the main architect in this endeavor, a position possible as long as accessible learning resources were in the hands of the teacher. He suggested the epochal challenges of globalization (Klafki, 1985) to direct the criteria for educational decisions of what resources to choose.

The increased focus on learner-centred education in the 90'es and 00'es paved the way for an approach to pedagogy where focus shifted from the teacher as the main actor in a learning process to the learner. The focus was suitable to the upcoming digitization of education. Online education and learner-centred pedagogy fitted the turned relationship focusing on the learner and facilitated new approaches to teacher professionalism due to an increasing accessibility to information. Learner-centred education, however, was criticized for being inadequate to meet the needs of the teacher and the institution. Rather than learner-centred, Anderson (2008a) suggested *learning-centred* education. This approach requires that the teacher gain an understanding of the learner's prerequisite knowledge including any misconceptions that the learner starts with. Furthermore, the students' learning cultures should be considered as well as the restrictions from digital accessibility.

Still, the online interactions between teacher and student were considered difficult according to Anderson. The identified difficulties may be due to a paradigmatic outset in which the online activities are compared to physical presence. The tendency to make comparisons between physical and digital presence is well documented among online participants, both teachers and learners (e.g. Buhl et al, 2014; Draper, 1998; Markham, 1998) and refers to the paradigm drawing on learning as an individual and/or social endeavour.

The initiators of connectivism suggest a paradigmatic shift of learning theories to meet the implications of that. But this has brought the teacher-learner relation towards an instrumentalised interaction process where the

mutual progression of new insights has been disrupted and replaced by teacher coaching as a generalized guidance. The committing engagement is displaced to a student-student interaction. The implications of that development take different forms depending on which knowledge domains involved, because the domain represent different traditions of learning practices and learning cultures.

4.2 Discipline-informed learning

Anderson suggests that learning is closely connected to the domain of knowledge (2008a). This point was also made by evaluators of UK MOOC (Bayne and Ross, 2013). Anderson argues that effective learning is both defined and bounded by the epistemology, language, and context of disciplinary thought (2008a, p. 49). Even though this is scarcely addressed in discussions of MOOCs, the domain of knowledge plays a significant role for the educational design of learning processes. The discussion was actualized by the fact that the first MOOC dealt with "connectivism and connective knowledge", and the pedagogical approach of this MOOC was a way of acting out the specific topic under study, and thereby generated a domain specific learning approach, which were appropriate for the knowledge domain of connectivism and MOOC. The question is whether this approach is suitable to other knowledge domains and whether it can be generalised? The emergence of the first xMOOC was about artificial intelligence (AI) and the educational design took the instructional technological approach (cf. Tyler). The learning object in the AI course was not about MOOC, but about another knowledge domain. The question is whether this learning approach would be suitable to other knowledge domains?

What we are trying to stress here is the need for discussions of the cohesion between knowledge domain and learning approaches in very different disciplines (e.g. in arts, humanities, technical, social, and natural sciences) and with very different learning objects. We are addressing the basic didactic questions of the 'what', 'how' and 'why' and the relations between them. Different knowledge domains create different learning cultures which must be dealt with when educational technologies are launched in a worldwide perspective.

An international collaborative project on MOOC in the international Asian-European network on e-learning (eASEM) reveal a broad range of knowledge domains in focus of the implementation strategies for MOOC (Jung and Kim, 2015). At the current state of development most countries focus on MOOCs on a generalized level in which discussions of the relationship between knowledge domains and educational design are not yet taken. The governmental ambitions towards the implementation of MOOC in different areas reflect the national educational systems. MOOC is expected to solve a huge educational challenge in some countries and their concerns are on a national level. Most of the reports from the project are occupied with developing MOOCs for a national task rather than a global. From that perspective the questions of knowledge domain remain embedded in local learning cultures, which take discussions of MOOC in another direction than the discussion in e.g. Canada and America, in which a worldwide perspective is taken on the distributions of a local design.

An example of a cross-national MOOC endeavour shown in the Danish contribution to the collaborative project describes a case of a MOOC design for Indonesian caregivers (Buhl et al, 2015). The domain of knowledge is national biased by the Indonesian localization, but the MOOC is educationally designed by a Danish scholar involved in an international Non-Governmental Organisation (NGO) doing development work in different countries. The case show the challenges of designing domain-specific education in a large scale programme for a particular target group from a domain representing learning cultures, where it is not yet settled which pedagogical approaches they may benefit from. Are the suggested MOOC models applicable for the learning content in the domain of care givers? Are there differences between domains drawing on practical skills and domains drawing on intellectual skills?

5. Conclusion

Like other innovations in the various areas of educational technology, MOOCs are no quick fix to overcome a massive need for education through new technological achievements and generalised learning theories. The massive MOOC development however highlights the search for developing ways of using digital technologies in education not just to repeat old structures. A potential of MOOCs may be the framing of the development of open networking among the participants. Still, the networking needs the presence of teachers as well as learners and framings of content in shifting and multiple relations.

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