MOOCs: Where Technology Meets Pedagogy

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Abstract

The rise of the MOOC (Massive Open Online Course) has been the cause of many discussions within the world of higher education. This literature review will examine the development of MOOCs and how they have affected and been affected by pedagogy, both online and offline. The variation in pedagogical style and design between the xMOOCs and the cMOOCs will be examined, followed by a review of how teacher centric pedagogy and connectivist learning styles are viewed by teaching staff and students engaged with MOOCs. With this comes the question of whether connectivism is a pedagogy in its own right or merely a technologically enhanced version of Problem Based Learning (PBL) and social cultural theory. The final area of discussion will be how the effect of a shift in pedagogy within the sphere of MOOCs could change teaching methods in the offline classroom. The way in which MOOCs are taught and how students learn from them is evolving; whether the ideal MOOC is connectivist or teacher centric is yet to be seen. This discussion will, like the MOOC, develop with time, and will not only effect how the MOOCs are taught but could have substantial effects in the offline classroom.

1.0 Introduction

MOOCs are making headlines in the field of education around the world, being heralded as bringing new ways of teaching and learning to the masses, and as forerunners of an educational revolution(1). With these bold claims there must come research to support the advancement of MOOCs. There are many aspects of the MOOC that raise questions and concerns among those affected by them. One key area in the development and the continuation of MOOCs is the pedagogical structure they take. With the rise of terms such as xMOOC, cMOOC and connectivism, "MOOC 2.0" will need to be built on an understanding of how MOOCs are affected by and effect pedagogy.

2.0 A Short History of MOOCs

Before assessing the current situation of MOOCs and their pedagogy it is important to understand where MOOCs have come from and how they function. The origins of MOOCs can be found in Open Education Recourses (OERs) such as the OpenCourseWare offered by MIT (Massachusetts Institute of Technology) (http://ocw.mit.edu/index.htm). The first incarnation of the MOOC was run between September and December 2008, called "Connectivism and Connective Knowledge" (CCK08)(2). However MOOCs were launched to the front of the e-learning debate in the winter of 2011, when Stanford University ran two courses "Introduction to Artificial Intelligence" and "Introduction to Machine Learning", which together attracted over 161 000 participants(3). This was followed by the founding of first MOOC platforms, such as Coursera, Udacity and EdX.

The MOOC format is unique to the teaching staff running a given course however a usual pattern of teaching styles is emerging. With MOOCs becoming a buzz word among educationalists, each part of the acronym is important in separating MOOCs from other forms of e-learning. MOOCs are:

Massive – there can attract hundreds of thousands of participants.

Open – This can be connected to three aspects of openness: free to access; liberty (such as freedom of speech); free transference of knowledge and ideas between participants(4).

Online – Course material is accessible over the Internet; although there is often a central site designated to the course other web-based sources are often created by participants(5).

Courses – MOOCs are usually defined as courses and follow traditional course patterns in that they have start and finish dates(6).

The MOOC format is in most cases based around video lectures, with accompanying notes and lecture slides which are uploaded to the main MOOC website, which participants can access and work through in their own time and speed(7). The duration of video lectures usually runs between two and 15 minutes, and are often intersected with short quizzes to assess learning(3,6). MOOCs often also feature longer assessments, with grading occurring in one of three ways, either computerised grading for multiple choice questions, or peer-to-peer or self-assessment grading for essays(8). The last feature of the MOOC is that most often

there is a forum for students to ask questions and discuss problems and experiences(7). This social interactivity has been around from the very beginning of MOOCs, with participants using socialisation to enhance their knowledge acquisition and assimilation(9). This goes beyond the course's own website and forum and branches out to Facebook, Twitter, personal blogs – both pre-existing and set up solely to discuss the MOOC – and other social networking sites(5).

This social aspect could be argued by some to be the defining point of MOOCs that separates them from OpenCourseWare and webinars, yet it is also a point of separation in the world of MOOCs themselves. This divide splits MOOC pedagogy in two, with some MOOCs focusing on the delivery of knowledge to the passive learner, and others focusing on the power of shared learning and interactions.

3.0 X or C MOOC?

The divide caused by the pedagogical split in the sphere of MOOCs has led to the creation of two subsections. The first based on the connectivist principles is the cMOOC or connectivist MOOC(10). The second finds its pedagogical roots in more traditional teacher centric methods and is labelled the xMOOC(11). Before discussing how each of these teaching and learning methods effect teachers and students using the x or cMOOCs it is important to delineate between the two.

The cMOOC or connectivist MOOC is perhaps the earliest form of MOOC design, as the first MOOC CCK08 was designed by George Siemens and Stephen Downes as an experiment to test Siemens' theories on pedagogy in connection with Web 2.0(4). Because of its basis in connectivism the cMOOC focuses on the social experience of knowledge acquisition. A cMOOC participant is faced with tasks and assignments to support the information they are learning. Furthermore they are free to access all possible sources for information, which they then have the potential to discuss and disseminate among their fellow participants. This collaboration to make full use of the course's potential was seen from the beginning of the cMOOC, where students created Twitter posts, Facebook groups, blogs and other social media(5). The amount of information available which was participant created and participant led in the CCK08 MOOC was far greater than the material available on the original course site. As such the cMOOC is not only a course with assignments and start dates, but it goes beyond that, with each cMOOC being a shared social experience of learning.

The other MOOC model, the xMOOC has somewhat of an air of mystery around its name, while there is some discussion on blogs and website fora as to what the X actually stands for there is no one academic consensus. One possible explanation for the X in xMOOC stands for extension(12), due to the nature of xMOOCs being extensions for offline courses. While the name of the xMOOC may be uncertain what constitutes an xMOOC is much simpler. The xMOOC is much less socially orientated than its cMOOC counterpart and has been described as a collection of resources(13), where knowledge is replicated rather than created(11), with

traditional teaching styles of passive learning and repetition of knowledge. The xMOOC can then be described as an educational tool where participants navigate the course in a mostly solitary way, working as a passive vessel for knowledge and reiterating this knowledge through essays and quizzes. Panchenko(11) suggests that the rise of the xMOOC has come from the rise of MOOC platforms such as Coursera, Udacity and EdX which mostly host xMOOCs. As such when thinking about and discussing MOOCs it is understandable that it is the xMOOC that appears most often.

It is, however, an interesting feature of the MOOC that where in offline pedagogy there is now a move away from teacher-centric learning(14) within the sphere of the MOOC there is a shift back towards it; from the original concept of the CCK08 MOOC that focused on the connectivist outlook of a mass social learning event to the use of passive learning through video lectures and quizzes of the xMOOC. The line between xMOOCs and cMOOCs would then appear to some to be clean cut, and the pedagogical battlefield clear demarcated.

4.0 The Decision to xMOOC or to cMOOC

With the battlefield of cMOOCs and xMOOCs clearly defined, it is the teachers and students who must pick their way through to achieve an educative goal. With MOOC platforms such as Coursera collaborating with ever increasing numbers of universities and with this increase in courseware attracting ever increasing numbers of student, MOOCs and their pedagogy must be viewed from the standpoint of the teacher and the student. This raises the question as to how both groups respond to the differences in pedagogical approaches of MOOCs and the MOOC platform.

Teaching staff's responses to MOOCs range from intrigued to outraged(15). However few distinct comparisons have been made between xMOOCs and cMOOCs from a teaching staff perspective, with the wider term of MOOC being applied to experience reports without differentiation. This said Michael S. Roth discusses his experience teaching an xMOOC on Coursera(16). His greatest fear was that the online platform would not contain the same important real time emotions of a classroom, this fear was not only unfounded but he discovered that the MOOC participants brought with them a wealth of difference and diversity far greater than he had seen on a university campus. Kolowich(17) conducted a large scale survey of lecturers who had run or were running MOOCs, predominantly xMOOCs, the survey suggested that most lecturers who had undertaken the running of a MOOC viewed the experience as positive. 79% of participants (N=103) responded that MOOCs were worth the hype. That said Kolowich found evidence that teaching staff can spend upwards of 100 hours of manpower to assemble the required learning materials for their MOOC(17). Further to this he adds that lecturers find that in teaching online courses their offline work suffers due to the amount of time demanded by the MOOC. As such for teaching staff MOOCs of both subtypes can represent an exciting, and fulfilling teaching environment, however they can pose an often underestimated amount of work.

Whilst the reports on teaching xMOOCs and cMOOCs are somewhat sparse, the same is not true when looking at a student population. This can be seen very clearly in the case of the cMOOC and in particular those from the early incarnations of the MOOC. Mackness, Mak and Williams(4), describe their findings from a study into participants of the CCK08 course. They sent out a survey (N=301), and followed up the survey with email interviews (N=58). Their findings indicated there were four key characteristics of the cMOOC which participants reacted to, these were: diversity; autonomy; openness; connectedness/interactivity.

In the case of diversity, the self-directed nature of MOOCs, particularly the cMOOC, left some of the participants behind, such as those with dyslexia. With the need for participants to traverse the educational tools and additional material created for the course, participants without the necessary research skills can find themselves lost in the sheer volume of information. A cMOOC such as CCK08 does not put into place systems to support the diverse skill sets of its participants. One participant described the need for better control of the fora, likening the experience to kids being in control of the classroom. This need for organisation to enable all learners to develop is, as described by Mackness, Mak and Williams, somewhat paradoxical as it then limits the autonomy of the participant.

The second aspect, where the learner must grasp the notion of independent learning, is autonomy. Participants in the CCK08 MOOC had mixed feelings towards their autonomy in the class. One participant suggested that the autonomy to learn as and when they felt able to allowed them to fit study around offline work schedules. While another participant said they would have liked more guidance, and whilst freedom is in their words “great”, there were no structures to support their learning. Participants also found that the lack of guidance, particularly within the forums, led to a number of people trolling the site (creating deliberately inflammatory posts and discussions in order to upset, offend or enrage others). This behaviour led to some of the MOOC participants feeling the fora were unsafe places to discuss information and knowledge. As such participants enjoyed the freedom they gained in studying the course but found it frustrating when guidance was needed and, due to the autonomous nature of the course, difficult to find.

Openness also played an important role in the participants’ experience of the course. Beyond the openness of the CCK08 MOOC being free to participate in, there were other forms of openness including freedom to access (such as the ability to work at two in the morning), openness of speech and openness in the sense of transparency and sharing between learners. The difficulty for some participants comes in the form of transparency and sharing, with only 14% of participants sustaining an active level of participation and interaction. One participant stated that they mostly observed and did not get involved with fora conversations. The various perceptions of openness, coupled with the difficulties of diversity and autonomy, and the free nature (both in the monetary and philosophical sense) of CCK08 led to participants lurking rather than fully engaging with the course.

The final aspect, connectedness and interactivity, a key functionality of the cMOOC, is to form learning networks and forge connections to facilitate the participant's learning experience. One participant talks about the various methods they used to connect to other participants via email, live chat, forum posts and blogs; they suggest that the connections they made, although temporary, were meaningful in their learning. However connectedness and interactivity could be hampered due to the behaviour of other participants with participants citing the issue with people trolling the fora and other unpleasant behaviours. Furthermore participants seem to form smaller subgroups on the network, with one participant indicating they communicated predominantly with between four and ten people. As such whilst the cMOOC promotes connectedness and interactivity, there are underlying problems that can limit participants' experiences.

Following the research into the CCK08 MOOC, Levy (a researcher-come-participant) discusses his experiences of the 2010 cMOOC PLENK2010(18). He outlines four lessons he has learned from his MOOC experience, which enhanced his learning and could be applied to others undertaking a MOOC, these are:

1. Learning from MOOCs is possible – The author describes the experience of the cMOOC as like swimming through a sea of knowledge and that his learning was enhanced by the sheer volume of other participants and their contributions to the course in the form of mass collaborative learning.
2. Learning occurs in back channels – Within the PLENK2010 course there were a number of live lectures, which also incorporated a live chat between students actively watching the streaming lecture. This live chat whilst being somewhat frenetic allowed the author to discuss and dissect that which was being said in the lecture. This allowed for not only better knowledge retention but better understanding of the topic at hand.
3. Learning without assessment – Levy found that many of his fellow participants took the course without the external pressures to partake in any formal assessment. Further to this Levy questions how this learning with lack of formal assessment could affect offline learning.
4. Learners need a daily reminder – The teaching staff running PLENK2010 created a daily newsletter called "The Daily". This newsletter outlined details of the course as well as a number of blogs and twitter posts that were pertinent to the course. This allowed the participants to sift through the sea of knowledge without spending hours searching, and served as a daily remind of events happening on the course.

These two insights into the workings of the early cMOOC phenomenon indicate that participants undertaking a cMOOC need to embrace the self-directed learning pattern and be prepared to use the fora and other educative tools available to them to develop the openness and connectedness of the course.

In the case of teachers MOOCs are hard work, with hundreds of hours of labour just to set them up, however they can be highly rewarding and a positive experience that can alter the teacher's teaching style in his or her offline classroom. For the student, the MOOC, and doubly so the cMOOC, can be a frustrating sea of

knowledge that is difficult to traverse, however with the use of a connected and shared personal learning environment that gives the participant the ability to discuss, assess, acquire and disseminate knowledge with others on the course, the MOOC can lead to a worthwhile and fulfilling collaborative learning experience.

5.0 Connectivism – Pedagogy?

While the overall learning experience of the cMOOC is successful, one issue that must be raised is that of pedagogy. As has already been mentioned the C in cMOOC stands for connectivist. What is connectivism and at what point does this new learning theory become a pedagogy in its own right, or is connectivism merely the application of technology to pre-existing theories?

The first stage in discussing the theoretical credentials of connectivism is to understand the model of connectivism. Designed by George Siemens(19) with connections to Stephen Downes(20), connectivism strives to be a pedagogy for the digital age. The model of connectivism builds on pre-existing theories such as Social Network Theory(21), social constructivist theory(22) and social cultural theory(23). Siemens outlines the key feature of connectivism(19), which are:

- Learning may be found in non-human appliances.
- The process of connection between specialised nodes or information sources is defined as learning.
- The potential to acquire more knowledge is more important that currently known information.
- All connectivist activities have the intent to find accurate up-to-date knowledge.
- To facilitate further learning, connections and networks must be maintained and cared for.
- Knowledge and the ability to learn require a diversity of opinions.
- A key skill in learning is the ability to make connections between concepts, ideas, and fields of knowledge.
- The ability to make decisions is a key part of the learning process; that which was applicable today may not in time remain applicable due to changes in the information and knowledge.

Siemens argues that connectivism can be applied where behaviouralism, cognitivism and constructivism reach their limitation (predominately due to the connectedness nature of the internet). The connectivist model moves away from the “sage-on-a-stage” teacher-centric pedagogy and embraces a many-to-many multiple network approach; with this, the nature of how knowledge is used and diffused and its perceived scarcity is changed(24). The base model for connectivism when applied to a Web 2.0 setting can be seen within the cMOOC system where students are set tasks, often group ones, and then given free rein to explore, research, discuss and define their understanding of the knowledge needed for the set task. The way in which participants undertake this exploration is by forming networks of learners to share a collaborative understanding and acquisition of information. This is the key aspect of connectivism - people learn through the dissemination of information through their network.

There is however criticism of connectivism, which suggests it may not be a pedagogy at all. Clarà and Barberà(25) outline three problem areas that limit the application of connectivism and its status as a pedagogy, these are: lack of discussion of the learning paradox; under-conceptualisation of interaction and dialogue; limited ability to explain concept development. The learning paradox was first described by Socrates(26), and when applied to connectivism is: how can a student know what networks to form when they are completely ignorant of the subject at hand? Connectivism does not explain how students gain the ability to judge without knowledge, to form worthwhile networks. This returns to the difficulties of the cMOOC wherein participants found they were lost in a sea of knowledge without guidance.

To address the next issue, under-conceptualisation of interaction and dialogue, Clarà and Barberà argue that connectivism views interaction as static and something that is either on or off. They propend toward the idea that human interaction is a process that evolves and develops through dynamics and it is this dynamic nature and evolution that is connected to the learning process. This is supported in other studies that find participants of MOOCs often struggle to forge and maintain meaningful learning connections(27).

The third area of difficulty is the limited way in which connectivism explains concept development. The question posed to connectivism is if the basis of learning is rooted in the connection of learners and the diffusion of knowledge through these networks, how then do concepts develop and change when the patterns of learners and knowledge stay the same. Clarà and Barberà indicate that due to this oversight of concept development and its inexplicability within the connectivist model the future for the model is bleak at best and is likely to lead to its abandonment as a form of learning theory.

Further to the three key criticism of connectivism, Bell(28) argues in her 2011 paper that, at this current stage in connectivism's development, it is a learning phenomenon rather than a distinct pedagogy or theory. Her argument is based on the limited academic research into connectivism where more could give the theory academic rigour. Furthermore she argues that what little has been written has been focused as a response to connectivism rather than an in-depth study of the theory.

However the creator of connectivism George Siemens argues against suggestions that connectivism is purely a phenomenon(29). He discusses the role of meaning making, which is closely connected to sense making. This process of meaning making, which does not occur in isolation, is the way in which the student determines possible impact, outcomes or effects of knowledge. This then is important when reviewing the concept of the learning paradox, in that while students may be ignorant on a subject they use their meaning making skills to ascertain that which they do not know.

The issue of under-conceptualisation of dialogue and interactivity is developed in a discussion as to the use of language and communication for the power of learning and education. This discussion outlines the challenge of learning, in that the student must hold a common language of meaning in connection to learning and knowledge, which explores how cognition and emotions which support the process are influenced by linguistics, with the method of delivery of knowledge and information and the medium for exchange being technology. With this technology the roles played by people are less static in that they can be both the artist and the viewer. This in turn makes changes to how dialogue and interactivity is shaped and channelled by those using the Internet for educative purposes.

The third issue of concept development is addressed in that whilst social networks may stay the same, a) knowledge networks alter with the rapid creation of online content, and b) discussion between the networks allows for generation of further content and thus expands the concept, causing concept development.

A middle ground has been drawn on the subject of connectivism and its status as a pedagogy. Cabiria(7), suggest that connectivism may not be a pedagogy in the sense of a learning paradigm across all forms of education but that it could be a pedagogy which is solely applicable to the MOOC phenomenon. This in turn suggests that MOOCs themselves are a unique educational experience.

Connectivism, like MOOCs, is still in its infancy and time will tell how this new model for learning will best fit with other such forms of teaching and learning. While there are possible areas for contention as to the nature of connectivism some of these areas could be addressed with further research and theory development. Rome was not built in a day and nor is educational pedagogy. One aspect that does become apparent is that connectivism is closely tied to the development of MOOCs and their future is likely to be intertwined.

6.0 Pedagogy of MOOCs – Online/Offline

The MOOC, whether it is an xMOOC or a cMOOC, has altered the field of e-learning. The connectivist learning theory has provoked conversations and debate as to the nature of pedagogy for education centred in Web 2.0. However whilst there is the drive for e-learning, education online for a digital age, there is still offline learning. With the changing pedagogical methods of the MOOC effecting online learning, it is also possible to see their effects in the offline classroom.

A key area of change within the offline classroom is the notion of the flipped classroom(8). This is where students watch lectures in their own time and engage in practical work during face-to-face time with lecturers. This allows for students to test their learning with guidance from a lecturer, so any misunderstandings of theory can be addressed before they become imbedded in the learner's concept. Research shows evidence that students studying under the flipped classroom model show a significant improvement over their traditional classroom counterparts(30).

Another aspect that some lecturers are introducing into the classroom is the quick fire quizzes that go hand in hand with most video lectures within the xMOOC(17). Michael J. Cima, an MIT professor of materials science and engineering, indicated that he would be incorporating quizzing into his offline classroom. However where online students can take quizzes at the own pace unchecked, students in the offline classroom would be tested at a time set by the instructor and with a proctor.

There are those who would have the MOOC phenomenon disappear(31). However there are aspects resulting from the MOOC phenomenon that are potentially beneficial, with lecturers flipping the class room allowing students time to ask questions and develop skills needed to think for themselves. The MOOC is making huge waves in the e-learning community and it is quite understandable that the offline education community is being affected by some of that splash.

7.0 Conclusion

There are two clear subsets of MOOCs, and it will be up to those designing and running them to decide if one, if either, will prevails. Only time will tell if those with the power to decide continue with the teacher-centric, passive learning model of the xMOOC, or if they embrace the student-centric, collaborative cMOOC.

Current studies suggest that teachers are more in favour of the xMOOC, despite their high work load, whereas students seem to find cMOOC more rewarding despite frustration at the lack of guidance from the course convenors. The differences between teachers' and students' choice of xMOOC or cMOOC could potentially become clearer and better defined as the MOOC phenomenon develops. This said, for the cMOOC to become the dominant MOOC on the circuit, there must be verification of its pedagogy. Currently there is some debate in the academic world as to whether or not the connectivist learning theory is a pedagogy or even a learning theory. The future for this model will resolve itself over time, either by irrefutable evidence that connectivism does not fulfil requirements to be accepted as a pedagogy, or by the development of connectivism through academic research and rigour to become an acceptable pedagogy, building on the blocks left by the likes of Vygotsky and Piaget.

The upheaval of e-learning that MOOCs have caused is beginning to filter through into the offline classroom. Lecturers who are experimenting with new ways to teach and students who are experiencing independent ways to learn are coming together to enhance the offline learning experience. Classrooms are becoming more pragmatic with the focus on hands on learning experiences shared with the lecturer and the class. The future could potentially herald the age where the homework is where the learning of the theory and the lecturing happens, and the class is where the experimentation and knowledge exploration ensues.
MOOCs of both subtypes are playing their own part to define the way in which learning is changing, as xMOOCs favoured by the large MOOC providers deliver courses to an increasingly wide audience, and cMOOCs assist the potential

development of pedagogies dedicated to the digital age. However the true test of the MOOC in both its forms will be time - how their teaching styles develop, how connectivism grows to become a recognised learning theory or withers in the wake of further research, and how students and teacher respond to MOOCs 2.0. The MOOC is here and now and causing a buzz in the world of education, whether this buzz will allow the MOOC experiment to further grow until it is as common an educative tool as books, blackboards, pens and paper, time alone can tell.

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