

what

Massive

Open Online Courses

Have to Offer K-12 Teachers & Students



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About

About Michigan Virtual Learning Research Institute

In 2012, the Governor and Michigan Legislature asked the *Michigan Virtual University*[®] (MVU[®]) to establish a center for online learning research and innovation, and through this center, directed MVU to work on a variety of projects. The center, now formally known as the *Michigan Virtual Learning Research Institute*[™] (MVLRI[™]), is a natural extension of the work of MVU. Established in 1998, MVU's mission is to serve as a catalyst for change by providing quality Internet-based programs that strengthen teaching and learning for K–12 education. Toward that end, the core strategies of the Institute include

- Research – Expand the K–12 online and blended learning knowledge base through high-quality, high-impact research;
- Policy – Inform local, state, and national public education policy strategies that reinforce and support online and blended learning opportunities for the K–12 community;
- Development – Develop human and web-based applications and infrastructures for sharing information and implementing K–12 online and blended learning best practices; and
- Innovation - Experiment with new technologies and online learning models to foster expanded learning opportunities for K–12 students.

MVU dedicates staff members to MVLRI projects as well as augments its capacity through a Fellows program drawing from state and national experts in K–12 online learning from K–12 schooling, higher education, and private industry. These experts work alongside MVU staff to provide research, evaluation, and development expertise and support.



About

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Abstract

Massive open online courses (MOOCs) have been on the forefront of current conversations about teaching and learning in the 21st century. The ability for participants at all levels to take free courses in hundreds of topics ranging from guitar to nuclear physics has created as many opportunities as it has challenges and questions. For the most part, the topics and the conversations have focused on professional development and post-secondary education; MOOCs may end up changing how we teach and learn at the graduate and undergraduate levels. However, MOOCs are also now being implemented in K–12 environments. There are several ways in which MOOCs in their current formats can be used by K–12 students and teachers. There are also several benefits from K–12 educators considering the definitions of MOOCs and the concepts they present. This paper presents a conversation about the potential value of MOOCs in K–12 teaching and learning.

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Introduction	01
A Brief History	02
A MOOC by Any Other Name	03
Do MOOCs Work?	05
The Practical Value of MOOCs	08
The Conceptual Value of MOOCs	09
Conclusion	11
Endnotes	12

Introduction

Massive open online courses (MOOCs) are free, online courses that are typically attended by a large number of participants.⁹ A learner can visit the website of one of multiple MOOC providers (e.g. *Coursera*,¹⁰ *edX*,¹¹ *FutureSense*,¹² or *Udacity*¹³) and sign up for a free course in anything ranging from psychology to nuclear science and from programming to learning a foreign language. New platforms have also been developed that allow those not currently partnered with large providers to still offer MOOCs (e.g. *Canvas*,¹⁴ *Udemy*,¹⁵ *Mooc.org*,¹⁶ or *CourseSites*¹⁷). When participants enroll, they typically attend a 4-15 week course with anywhere from a few hundred to 100,000 other participants. It is free in the sense that anyone can join as long as they have access to the Internet. Typically those who complete the MOOC receive a certificate of completion (with or without a set of virtual badges¹⁸); in some cases, participants can also pay to receive professional development, college, or graduate credit. Most MOOCs have been aimed at post-secondary or professional development audiences, although recent MOOCs have attempted to include K-12 students.¹⁹

Most current conversations about education and the potential role of technology in teaching and learning have directly or indirectly included the topic of MOOCs. The term has become so popular, in fact, that it was recently added to the *Oxford Dictionary* (online). Unfortunately, many of the recent MOOC headlines have been so polarizing, that K-12 and post-secondary educators are often unsure what to make of MOOCs or their potential impact on teaching and learning. Proponents of MOOCs end up promising the end of traditional education and universities/schools as we know them; critics suggest the early death of another attempted panacea for the problems plaguing our learning environments.²⁰ George Siemens—a key figure in MOOCs—summarized the contention appropriately by suggesting that if 2012 was the year of the MOOC, 2013 is the year of the anti-MOOC.²¹

This diversity of opinion is partly due to the fact that MOOCs are often lumped into one category or definition. Much like many of their educational technology predecessors, they are being continually assessed and described as negative or positive without more deeply exploring the characteristics that further identify them and make them more or less useful in various situations or in specific instantiations.²² That is problematic because **the idea of a MOOC and how MOOCs are implemented into practice are not the same thing**. Some educators have translated the concept of a massive open online course into a dissemination technique for dropping knowledge into the heads of thousands of ‘learners.’ Others have viewed MOOCs as community-based experiences with less focus on graduation rates or college credit. Understanding the differences between these instantiations of the concept of MOOCs is required to help educators translate outcomes that vary from rewarding and community-building to frustrating and community-eroding.²³

Regardless of whether MOOCs end up radically transforming education or disappear tomorrow, there are valuable lessons that can be learned from both the practical interpretations of MOOCs as well as the theoretical underpinnings of the term. This paper will first address a brief history of the concept as well as existing definitions of massive open online courses. It will then describe some of the early research, which has been informative, commonsensical, and, unfortunately, lacking. The paper ends with a discussion of the practical value of using MOOCs as well as the conceptual lessons that K–12 educators can learn from MOOC design and implementation.

A Brief History

A number of important factors led to the creation and implementation of MOOCs. First, there is an entire movement dedicated to making content open and accessible. This movement has various proponents and actors, ranging from David Wiley’s work on reusing and remixing content²⁴ to MIT and other institutions or organizations making their content available online for others to use.²⁵ This also includes efforts by those creating and distributing videos to be used in both blended and online instruction (e.g., the Kahn Academy).²⁶

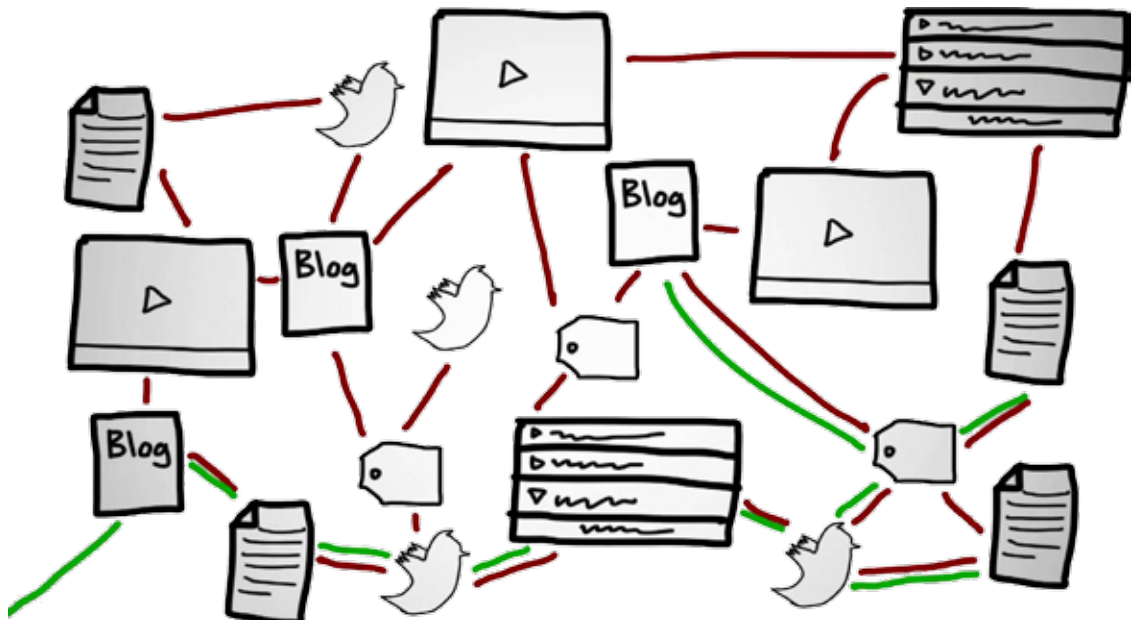
A second force is the growth of social media tools for creating and distributing ideas. Rather than having a single repository of ideas, content is now created by multiple individuals and hosted in a variety of formats. In the past, learners may have sought the advice of one expert or participated in a teaching experience on one learning platform. Someone wanting to study a topic today will watch a video on one site, read a blog in a different location, follow multiple Twitter feeds, and read

articles from yet another source (see Image 1).

A third factor is the recent growth in K–12 blended and online learning. The obvious connection here is that if a society already familiar with online and blended instruction is mixed with a new pedagogy that capitalizes on the availability and variety of tools and content, then the result is the perfect habitat for the development and delivery of free courses to the masses. However, there is another tie. Higher education was relatively slow to adopt online education. They appear to not want to make the same mistake and fall behind in the MOOC movement.^{28,29} This is particularly important at a time when society is attempting to provide alternatives for rising university and college costs³⁰—a conversation that institutions of higher education do not want to miss.³¹

Other factors undoubtedly forged and continue to shape this movement. However, these three issues provide examples of contributing forces that led to the birth of MOOCs.

Image 1: Dave Cormier’s representation of MOOC content, highlighting multiple paths with and through videos, tweets, blogs, etc. © Dave Cormier²⁷



A MOOC by Any Other Name



The Oxford online dictionary defines a MOOC as “a course of study made available over the Internet without charge to a very large number of people: *anyone who decides to take a MOOC simply logs on to the website and signs up*”³² (italics original). Such a simple definition, however, is never simple. Some educators have questioned the true nature of ‘open’ in MOOCs versus other open initiatives.^{33,34} And, Siemens, Downes and other early adopters have critiqued how MOOCs have been portrayed and have suggested a differentiation between xMOOC and cMOOC.³⁵ Finally, some have suggested we need a brand new term like DOCCs (distributed open online course)³⁶, HOOC (high school, open online course)³⁷ or MIIC (massively intensive innovative courses).³⁸ The confusion of terminology might lead some to wonder if this is just a case of academe-envy, with each new person trying to stick their own flag in the ground. At the core, there are significant differences in the terms that relate to the implementation of the idea into practice.^{39,40} This naming and rebranding also relates to theorists and practitioners trying to conceptualize and re-conceptualize this new learning space.

Let us examine, for instance, the differences between cMOOCs and xMOOCs. Arguably, each of the letters in the term can be adapted. For instance, one could address what was meant by ‘open’ or what was meant by ‘course’ (see Image 2). However, the key differentiation here is the C or the X⁴¹. “C” refers to a MOOC that is based in notions of *connectivism*. The pedagogical shift

called connectivism is tied to the availability of tools and content, 21st century learning, and how these both impact learning.⁴² Connectivism is also related to how people use these digital tools and environments to form networks and connections. Siemens argues that:

Behaviorism, cognitivism, and constructivism are the three broad learning theories most often utilized in the creation of instructional environments. These theories, however, were developed in a time when learning was not impacted through technology. Over the last twenty years, technology has reorganized how we live, how we communicate, and how we learn... Connectivism is the integration of principles explored by chaos, network, and complexity and self-organization theories. Learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing. (Siemens, 2005, n.p.)⁴³

A MOOC by Any Other Name (cont.)

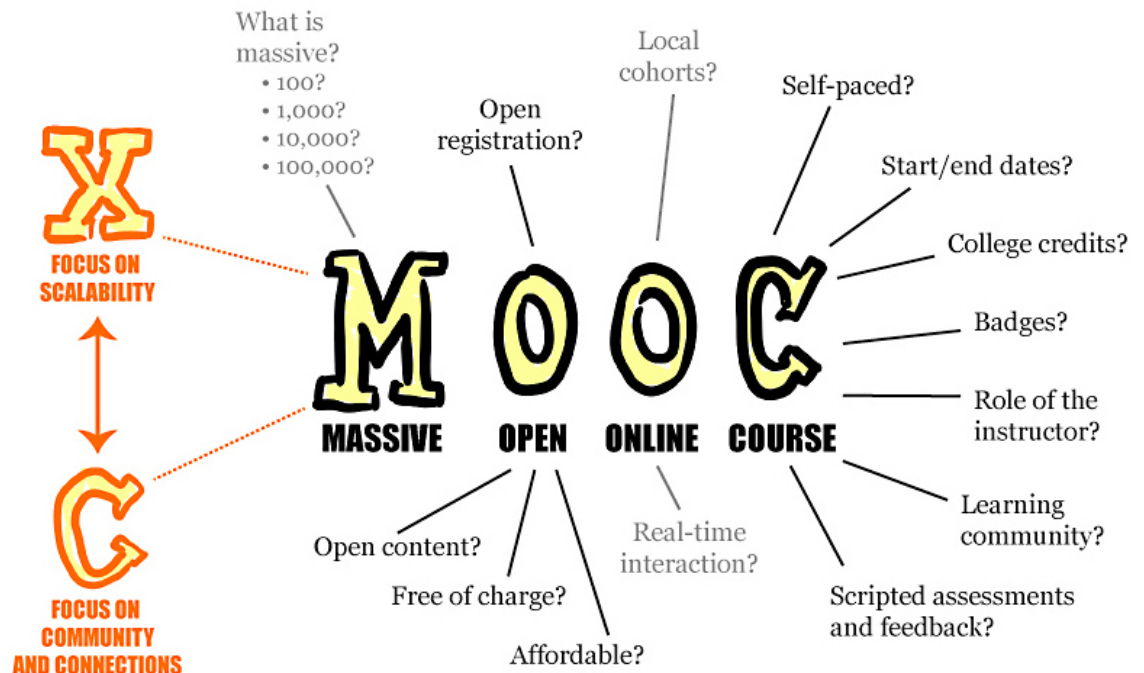
In cMOOCs, the organizers develop a framework by which to engage all participants around a common idea. Their work and effort is aimed at having each attendee act as both a participant learner and expert. Participants bring ideas, questions, content, and other material to a table where everyone is engaged for understanding something about the greater good of the topic addressed. Facilitators use a variety of tools to help aggregate the experience as most of the content is not located within a specific platform but across a variety of media tools (e.g., *Twitter*, *Facebook*, blogs, wikis, online articles, *YouTube*, etc.).

An xMOOC, conversely, is typically on university or university-partnered platforms and sponsored by universities or for-profit platforms (e.g., Coursera). “These MOOCs offered on university-based platforms are modeled on traditional course materials, learning theories, and higher education teaching methods. For example, they usually are organized around lectures and quiz-

type assessment methods. Also these courses typically use little distributed content that’s available on the Web outside the platform. Most course content is prerecorded video lectures which are posted on the courses’ home page.”⁴⁵

Typically cMOOCs are community driven with a goal of connecting people around an idea for the greater good of that idea. xMOOCs have often meant delivery of content in a traditional academic manner with one or more experts disseminating information in a way that leads to academic outcomes. In one, they will be part of a process (cMOOC); in the other they will be part of a product (xMOOC). No naming convention is ever perfect. There are xMOOCs that contain features of cMOOCs and vice versa. However, this basic delineation helps users understand the kind of experience they will have. It also helps educators understand why innovators have cared so much about the differentiation of terms.

Image 2: MOOC poster April 4, 2013, by Mathieu Plourde; licensed CC-BY.⁴⁴



Do MOOCs Work?

Educators are obviously interested in whether MOOCs are effective. Prior to attempting to answer that question, it is worth proposing that we ask a better question. Research on educational technologies will always produce enough varied results to document ‘no significant difference.’⁴⁶ Said differently, asking whether MOOCs work will always produce some research that shows positive outcomes and some research that does not. Therefore, as we collect more research on MOOCs, it would be more appropriate to ask under what conditions do MOOCs work?^{47,48}

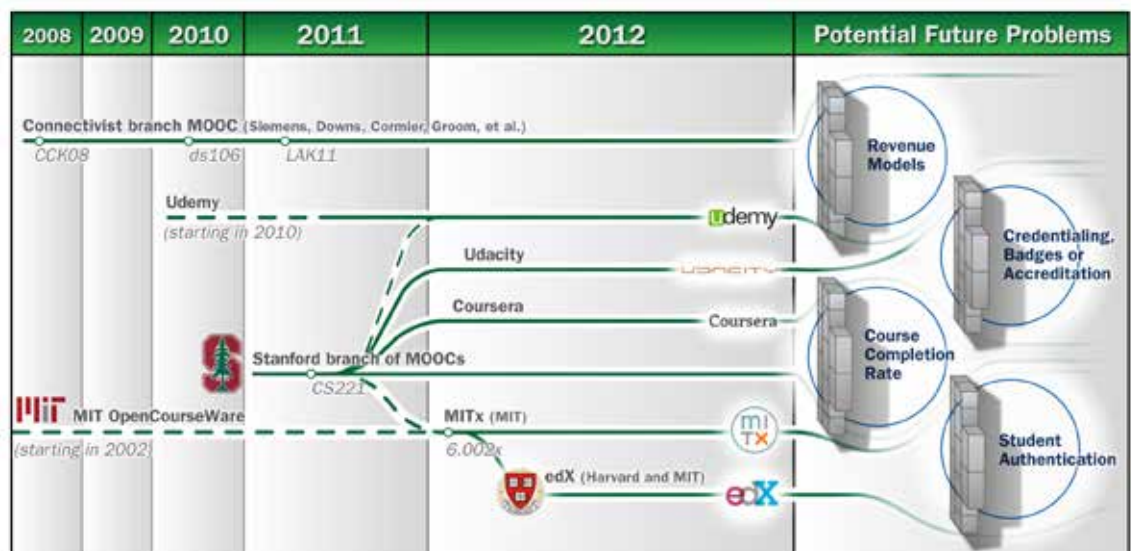
This revised question provides a better framework for attempting to understand when, how, and for whom the different types of large, open, online classes lead to intended or unintended consequences. However, even this question needs revision. If MOOCs differ in their design and desired outcomes, then there will be variations in both desired metrics and potential outcomes. A simple example is student completion rates. An xMOOC that is set up for college credit might face resounding criticism if 100,000 students enroll and only 5,000 complete the course. Conversely, if a cMOOC is designed as an experience that brings people around the table to have a conversation

and inquiry into a shared topic of interest, then it is assumed that people will join and leave that conversation. Some might stay for the duration of the course; others might stay for one session or module that deeply interests them.

Phil Hill (2012) developed a timeline to demonstrate both the origins as well as the types of MOOCs available (see Image 3).⁴⁹ In doing so, he was also able to describe both potential positive outcomes as well as problems faced by each type of MOOC. If MOOCs look different in their implementation and desired outcomes, then they will also run into different types of opportunities and challenges. This delineation and differentiation of the types of MOOCs is an important first step in answering if and how MOOCs work.

In the end, our final proposed question is: *under what conditions do (insert specific type of MOOC) work?*⁵⁰ There are a number of anecdotal experiences described and posted by teachers,^{51,52} or students,^{53,54} about their experiences in MOOCs. Unfortunately, there have not been enough published research studies to give us definitive answers.⁵⁵ This has led to experts in fields ranging from educational technology to economics to call for more

Image 3: MOOC Timeline, July 24, 2013, by Phil Hill; licensed CC-BY-ND.



Do MOOCs Work? (cont.)

research.⁵⁶ The good news is that given the increased popularity of MOOCs, there should be an increase in the availability of data on their design, development, implementation, and evaluation. And, given the high visibility of MOOCs, there are now organizations funding such studies. For instance, a Gates Foundation grant is supporting the development of a MOOC Research Initiative (MRI).⁵⁷ Experienced MOOC educators are also providing insight into the areas that deserve further exploration. In a 2010 article,⁵⁸ McAuley, Stewart, Siemens, & Cormier suggested an exploration of:

- the extent to which it can support deep enquiry and the creation of sophisticated knowledge;
- the breadth versus the depth of participation;
- whether and under what conditions successful participation can extend beyond those with broadband access and sophisticated social networking skills;
- identifying the processes and practices that might encourage lurkers, or “legitimate peripheral participants”, to take on more active and central roles;
- the impact or value of even peripheral participation, specifically the extent to which it might contribute to participation in the digital economy in extra-MOOC practices;
- specific strategies to maximize the effective contribution of facilitators in particular and more advanced participants in general; and
- the role for accreditation, if any, and how it might be implemented. (p. 7).

The remainder of this section is dedicated to highlighting some of what has come out of the earlier literature. It is worth acknowledging these studies did not necessarily set out to answer under what conditions certain types of MOOCs work.

Qualtrics and *Instructure* partnered in 2013 to survey MOOC students.⁵⁹ They discovered that course topic, followed by professional development, and costs were the main motivators for signing up for MOOCs. Course expectations not matching experiences and time were the top reasons for not completing the course. According to the survey results, two-thirds said they would be more likely to complete the course if certificates or college credit were offered. What is notable about the survey is the fact that a majority of MOOC attendees were highly educated, a finding that could be related to the type of content currently being offered in MOOCs. It could also be correlated to the lifelong learning patterns of educated participants, who often continually seek knowledge for intrinsic motivation or external rewards.

The National Science Foundation (award #1321336) awarded a grant to San Jose State University to partner with *Udacity* to develop and study three online, credit-bearing MOOC courses.⁶⁰ The preliminary results have been released and have found two outcomes. First, students who succeed are typically highly motivated. Second, there was a relative lack of human interactivity. Neither result is surprising. Although the early mantra was that online education was for everyone, researchers and educators soon discovered that it required a student that was motivated to learn. One can employ various techniques to externally motivate a student, but there had to be some degree of internal motivation. One of those techniques is obviously interaction with others. xMOOCs receive lots of attention for involving hundreds of thousands of students. However, these larger MOOCs often lack human interaction because they are not necessarily developed or devised as a community.

The lack of human interactivity is not a limitation of a MOOC, but rather a limitation in the design of some MOOCs. Additionally,

Do MOOCs Work? (cont.)

MOOCs that did incorporate higher levels of interaction, typically through peer-to-peer contact, have shown promise for increasing participant performance. A study from MIT found that peer interaction actually improved a student's chance of success.⁶¹ Breslow et al. (2013) documented:

However, if a student did collaborate offline with someone else taking 6.002x, as 17.7% of the respondents reported, or with "someone who teaches or has expertise in this area," as 2.5% did, that interaction seemed to have had a beneficial effect. On average, with all other predictors being equal, a student who worked offline with someone else in the class or someone who had expertise in the subject would have a predicted score almost three points higher than someone working by him or herself. This is a noteworthy finding as it reflects what we know about on-campus instruction: that collaborating with another person, whether novice or expert, strengthens learning. (p. 20).

Researchers from Italy recently examined a high school open online course (HOOC) aimed at helping young students learn about physics and math.⁶² Their project focused on the use of a video archive called *OpenDante*⁶³ and an open source automated recording system called *openEyA*.⁶⁴ Students participated in the experiment, data were collected on student performance, and then both parents and students were surveyed about their experiences. The authors concluded:

"On the basis of these students' answers and assessments, as well as from the supportive reactions from their parents, we can argue that the large majority of students watching the HOOC in the ODP believe that this optional facility helps them significantly for both: their study and homeworking. This conclusion

is also supported by the fact that our younger students have suggested or will suggest to their friends to use ODP on-line lectures. As far as we can deduce from the reported data, and by our own experience...we can say that the use of openEyA has proved to be a valuable tool to support the study and homework of all the students who have exploited this opportunity. The possibility to make curricular lectures also available online to students of an Italian High School (Liceo Classico) has shown to be feasible and low-cost. This is coherently reinforced by the suggestion made by students and parents to extend the OpenDante project to other non-scientific subjects" (n.p.).

Finally, it is worth noting that a recent paper attempted to analyze the existing research on MOOCs from 2008-2012.⁶⁵ As one can imagine, the amount of research has substantially increased in the last few years and will continue to grow with the popularity of MOOCs. The authors also found that most of the published research highlighted the role of the learner, with little research on the actual role of the facilitators or on the ethical aspects of using public data. This point raises a concern about the difficulty of such analyses due to the widespread location of such data (e.g., *Twitter* vs. *Facebook* vs. discussion forum posts). This recent paper also acknowledges high MOOC drop-out rates, especially for non-motivated participants (mirroring the San Jose State University work).

In sum, there is very little research in the post-secondary MOOC arena; it is almost nonexistent in K-12.⁶⁶ More will undoubtedly be published as MOOCs increase in popularity and use. The potential research topics seem endless, but a deeper understanding of the connection between type of MOOC and outcomes as well as the role of the facilitator seems pertinent.

The Practical Value of MOOCs

Universities face several questions as they consider what to do with “the attack of the MOOCs.”⁶⁷ These questions must be answered as opportunities and critiques mount.^{68,69,70} These questions and answers are also pertinent to K–12 teaching and learning. Research will provide additional insight; however, at their face value, MOOCs may provide both practical and conceptual benefits. Practical benefits refer to taking MOOCs (in various formats) and integrating them directly into either the K–12 classroom or the professional development plans of K–12 educators.

MOOCs can be used as supplemental student learning opportunities. Teachers have been successful in implementing MOOCs into the classroom. In some cases, teachers have taken what they have learned in a MOOC and turned the activities into student lessons. Others have had students enroll in part or all of a MOOC as part of the face-to-face course (a revised perspective on blended learning). In some schools, educators have used MOOCs as career exploration tracks. Students who might be interested in a certain career or who want to start college content early can participate in MOOCs. In limited cases, districts have considered offering MOOCs as a way to meet a state requirement for an online learning experience prior to high school graduation. Finally, some schools have used MOOCs as a way to offer content in areas they might not have the funding for or the expertise to offer. Granted, many of the current MOOCs are not directly aimed at K–12 students (e.g., many are related to college courses or post-graduate content). However, this may change as more K–12 content is put online and as more organizations explore K–12 credit for MOOCs.⁷¹

MOOCs can be used to provide diverse cultural, international, and interdisciplinary perspectives for both teachers and students.⁷² This does not happen automatically. However, given the size of MOOCs and their availability around the world, it is not uncommon for a community of practice to include those like the learner (e.g., same content area) as well as those different from the learner. A participant might engage with someone from a district or country whose practices are unlike his/hers. Motivated learners who are

willing to capitalize on this opportunity can begin to see the content in new ways. More importantly, learners begin to see content applied in different and unique settings. This can also happen with teachers or professional development leaders who are willing to broaden the boundaries of their ‘classroom’ by providing interdisciplinary and international experiences for their students and teachers.

MOOCs can be used as professional development by teachers or professional development leaders.⁷³ States are changing their requirements for continued professional development for teachers. And, funding continuously ebbs and flows for said activities. Some teachers have found ways to improve their professional practice by enrolling in MOOCs. This can mean taking classes for graduate credit; or it can simply mean enrolling in a course to obtain knowledge critical to content, technology, or pedagogy. By enrolling in these MOOC opportunities, teachers often end up with access to knowledge, skills, and experiences they might not have received in their local district—particularly if they have served in the same district for an extended period of time. Additionally, some districts that have been short on funding or short on expertise for professional development have turned to MOOCs as a way to provide personalized instruction and choice for teachers.

MOOCs can be used to improve and increase teacher community. Research on teaching has demonstrated that improved professional development typically leads to improved student outcomes. However, this professional development is done best in communities of practice.⁷⁴ MOOCs can provide an important way to connect with other like-minded professionals. This obviously will vary based on the format of the MOOC and the course content. However, in a truly connectivist MOOC, participants engaging with others is one of the natural experiences and outcomes. Teachers interested in capitalizing on this potential benefit will want to examine the syllabus and process described by MOOC providers carefully prior to enrolling.

The Conceptual Value of MOOCs

Even if MOOCs went away tomorrow, or if they failed to be incorporated into K–12 settings for some time, there are lessons to be learned from the concept of a MOOC. These conceptual benefits can be incorporated without having to directly implement or participate in a MOOC.

Connected Learning. Connectivism and connected learning are important concepts embodied in some forms of MOOCs. An extensive read on the concept and its research and design agenda was published by the *Connected Learning Research Network*.⁷⁵ Perhaps the greatest take-

away from the report and the connectivist movement are the three main areas of learning principles, design principles, and core values.⁷⁶ The learning principles start with an interest, are supported by peers, and are academically oriented. The design of the experience is production-centered, with a shared purpose in an open network. And the core values that tie this together are equity, social connection, and full participation. Although many of the ideas represented are based in past research and pedagogy, they present an interesting new way of thinking about how people learn (summarized in Image 4).

Image 4: Visual representation of 'Connected Learning'; licensed CC-BY.⁷⁷



The Conceptual Value of MOOCs (cont.)

Digital Badges:



Digital Badges. MOOCs can contain various forms of assessment. One form is the digital badge. The MacArthur Foundation defines digital badges as: “an assessment and credentialing mechanism that is housed and managed online. Badges are designed to make visible and validate learning in both formal and informal settings, and hold the potential to help transform where and how learning is valued.”⁷⁸ The idea is that once someone has reached completion of a set of objectives or challenges, they are then awarded a badge (much like organizations give physical badges for completing tasks). Mozilla has an *Open Badge Project*⁷⁹ that allows anyone to create a badge to recognize anyone else for knowledge or skills they have obtained. Some have argued that badges are not only motivational, but may also measure competencies better than traditional assessments.⁸⁰ Badges can be created by both teachers and students and may provide a new way for teachers to think about engaging, motivating, and rewarding students.

Open Content. Many educators have promoted the concept of open content. They define open by referring to the four Rs: reuse, revise, remix, and redistribute.⁸¹ Often teachers and administrators hear “open concept” and assume this means giving away all rights and credits to content that has been created. Nothing could be further from the truth. Open content is often discussed in the same context of Creative Commons licensing.⁸² The Creative Commons licensing options allow users to share ideas

or creativity while still retaining control of derivatives and attribution. Although there are questions about the ‘openness’ of certain variations of MOOCs, it is clear that they have helped educators further explore how to share their content. Creative Commons allows teachers and students to be producers of artifacts that become part of the connected learning network of other teachers and students.

Content repositories and student artifact creation. Many blended courses are still hosted in learning management systems where the content is stored in one location. (Content here refers to the content being delivered by the instructor as well as the outcomes and artifacts created by the learners.) There are a number of concerns with a central repository. First, it fails to recognize the value of content that exists in places outside of the instructor’s mind. Second, it makes the students’ creations a part of the course rather than a part of their experience as learners. For instance, an artifact created in an LMS is typically viewed by the instructor and the student. An artifact created and posted on a student’s social media site becomes part of their digital identity while reaching a much larger audience. Arguably there are concerns with safety that must be addressed; however, there are opportunities for students’ work to become the content by which others learn in the future. The work they create becomes embedded in an authentic community of practice.⁸³

Conclusion⁸⁴

There is no doubt that massive open online courses have been a focal point of education discussions in the last few years. These innovations have caused incredible, extreme, and opposite claims. Some have called them the “single most important experiment in higher education.”⁸⁵ Others have called MOOCs a ‘racket’ and something that will be horrible for professors and students.⁸⁶ If we’ve learned anything from hundreds of years of educational innovations, the reality is that neither is true. MOOCs are not going to revolutionize the world, nor are they so horrible that they should be ignored. Rob Reich (2013) argues:

Champions of MOOCs and online learning frequently exhibit a lamentable technoutopianism, making claims about the benefits of online education far beyond what any data currently warrants. Critics of MOOCs and online learning frequently exhibit a Luddite protectionism, as if the college campus and classroom should be immune from the effects of technological advancement that have swept across other industries. We ought to reject both stances. (n.p.)⁸⁷

There are multiple benefits to be gained for K–12 teachers. Those benefits include both the practical realities of MOOCs as well as the theoretical underpinnings that support the ideas that became instantiated in the idea of MOOCs. Some of the ideas explored here include access (e.g., to new ideas and to new people), choice (e.g., options for professional development), a potential for improved student learning (e.g., access to new materials and interdisciplinary conversations with, through, and about innovative technologies), and becoming part of the connected network (e.g., sharing their own content).

There are also several benefits for K–12 students. MOOCs may serve as an effective strategy to supplement existing content to make it more interesting, engaging, and informative. While enrolled, students are interacting with digital tools and environments that mirror

their current world and the academic and vocational environments they will enter. Such an opportunity seems magnified for those in developing countries or in schools or districts that may not have access to the expertise to teach certain subject areas.⁸⁸

Just because these are possibilities, it does not mean they will happen. There are a number of questions about how to best use MOOCs to achieve these theoretical and practical outcomes. Those questions include how we can teach teachers to successfully incorporate these into the classroom (e.g., how MOOCs can or should impact teacher preparation), how we guide interactions between various audiences (e.g., exploring whether youth are more apt or able to participate because of their affinity with social media), how we fund MOOCs (how ‘free’ will be sustained over time),⁸⁹ how we might be able to use MOOCs to continue to crowd-source complex problems, how we could use MOOCs for student development rather than just consumption, and how this new form of learning (digital pedagogy⁹⁰) will impact our theories of how people teach and learn.

In the end, Tom Whitby asks an important question: am I who I say I am?⁹¹ If we are to engage people with technology and promote ways for them to use it, then we ourselves are to be held accountable for using those same tools. Regardless of whether MOOCs stay forever or quickly fade away, it is our job as educators to understand the tools by which people are teaching and learning.

Endnotes

¹ <http://www.ferdig.com>; rferdig@gmail.com

² <http://www.rcet.org/>

³ <http://www.igi-global.com/ijgcms>

⁴ <http://www.ace.org/pubs/jtate/>

⁵ <http://link.springer.com/journal/11423>

⁶ [http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1467-8535](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1467-8535)

⁷ <http://virtualschoolmooc.wikispaces.com/>

⁸ <http://www.mivu.org/mooc>

⁹ An exemplary introductory video on MOOCs has been created by Dave Cormier at: <http://www.youtube.com/watch?v=eW3gMGqcZQc>; Readers can also consult the MOOC guide at: <https://sites.google.com/site/themoocguide/>. Finally, Stephen Downes, an expert in this area, writes consistently in this area: http://www.downes.ca/MOOC_Lit.htm

¹⁰ <https://www.coursera.org/>

¹¹ <https://www.edx.org/>

¹² <https://www.futurelearn.com/>

¹³ <https://www.udacity.com/>

¹⁴ <https://www.canvas.net/>

¹⁵ <https://www.udemy.com/>

¹⁶ <http://chronicle.com/blogs/wiredcampus/google-and-edx-create-a-mooc-site-for-the-rest-of-us/46413>

¹⁷ <https://www.coursesites.com>

¹⁸ <http://wiobyne.com/value-cognitive-authority-and-digital-badges/>

¹⁹ There is no way to list every offering, but here are some recent examples of K–12 MOOCs:

- <http://www.mivu.org/mooc>
- <https://www.canvas.net/courses/exploring-engineering-1>
- <https://users-mooc.amplify.com/>
- <http://www.phoenixcollege.edu/academics/programs/mathematics/math-moocs>
- <http://www.uwlax.edu/MathMOOC/about.html>
- <http://moocnewsandreviews.com/two-moocs-makes-track-record-university-of-miami-global-academy/>
- <http://moocnewsandreviews.com/leap-college-readiness-gap-best-moocs-for-high-school-seniors/>

Readers can also consult lists like those found at: http://moocs.co/K-12_MOOCs.html

Endnotes (cont.)

- ²⁰ <http://www.washingtonpost.com/blogs/answer-sheet/wp/2013/07/08/why-moocs-wont-revolutionize-higher-ed/>
- ²¹ <http://www.elearnspace.org/blog/2013/07/08/neoliberalism-and-moocs-amplifying-nonsense/>
- ²² Ferdig, R. E. (2006). Assessing technologies for teaching and learning: Understanding the importance of technological-pedagogical content knowledge. *British Journal of Educational Technology*, 37(5), 749–760.
- ²³ <http://chronicle.com/article/Professors-at-San-Jose-State/138941/>
- ²⁴ <http://www.opencontent.org/definition/>
- ²⁵ <http://ocw.mit.edu/index.htm>
- ²⁶ <https://www.khanacademy.org/>
- ²⁷ Permission to share this photo provided by Dave Cormier.
- ²⁸ <http://www.nytimes.com/2012/09/19/education/coursera-adds-more-ivy-league-partner-universities.html>
- ²⁹ <http://www.insidehighered.com/blogs/hack-higher-education/fomo-fear-missing-out-and-moocs>
- ³⁰ <http://www.cnn.com/2013/08/23/opinion/vedder-college-costs/index.html>
- ³¹ <http://money.msn.com/personal-finance/moocs-could-lower-cost-of-college>
- ³² http://oxforddictionaries.com/definition/american_english/MOOC
- ³³ <http://opencontent.org/blog/archives/2879>; Also see: <http://www.newappsblog.com/2013/09/free-stuff-amherst-college-says-yes-to-open-access-and-no-to-moocs.html>
- ³⁴ <http://halfanhour.blogspot.com/2013/09/two-comments-on-open.html>
- ³⁵ <http://www.elearnspace.org/blog/2012/07/25/moocs-are-really-a-platform/>
- ³⁶ <http://femtechnet.newschool.edu/docc2013/>
- ³⁷ <http://www.eurodl.org/?article=572>
- ³⁸ http://www.timesdispatch.com/opinion/their-opinion/columnists-blogs/guest-columnists/strong-miics-not-moocs-at-washington-and-lee/article_c9efafa6-aafe-56a1-a67e-32473c30cb35.html
- ³⁹ <http://www.hastac.org/blogs/cathy-davidson/2013/06/11/clearing-some-myths-about-moocs>
- ⁴⁰ <http://www.nytimes.com/2013/09/04/booming/answers-for-middle-aged-seekers-of-moocs-part-1.html>
- ⁴¹ For a more in-depth analyses, see: <http://moocnewsandreviews.com/ultimate-guide-to-xmoocs-and-cmoocso/>
- ⁴² <http://epltt.coe.uga.edu/index.php?title=Connectivism>

Endnotes (cont.)

- ⁴³ Siemens, G. (2005, January). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology & Distance Learning*, Retrieved from http://www.itdl.org/Journal/Jan_05/article01.htm
- ⁴⁴ <http://www.flickr.com/photos/mathplourde/8620174342/sizes//in/photostream/>
- ⁴⁵ <http://mooconewsandreviews.com/ultimate-guide-to-xmoocs-and-cmoocso/>
- ⁴⁶ Salomon, G., & Gardner, H. (1986). The computer as educator: Lessons from television research. *Educational Researcher*, 15(1), 13–17.
- ⁴⁷ Ferdig, R. E. (December, 2011). *Asking the right questions about the past, present, and future of K–12 online and blended learning*. Invited presentation to the Ohio Digital Learning Task Force. Cleveland, OH.
- ⁴⁸ The word ‘conditions’ refers to multiple factors including design, audience, technology, purpose, etc.
- ⁴⁹ <http://mfeldstein.com/four-barriers-that-moocs-must-overcome-to-become-sustainable-model/>
- ⁵⁰ See Curtis Bonk’s list of varying MOOCs at: <http://travelinedman.blogspot.com/2012/06/twenty-thoughts-on-types-targets-and.html>
- ⁵¹ <http://augmentedtrader.wordpress.com/2013/05/25/what-my-mooc-students-said-about-my-course-spring-2013/>
- ⁵² <http://www.tex2all.com/inside-of-a-mooc-a-first-feldgang-post-mooc-and-beyond-cycle-6/>
- ⁵³ <http://degreeoffreedom.org/xmooc-vs-cmooc/>
- ⁵⁴ <http://nation.time.com/2012/10/22/mooc-brigade-what-i-learned-from-learning-online/>
- ⁵⁵ A special issue of the *Journal of Online Learning and Teaching* was published in 2013; it is available at: http://jolt.merlot.org/vol9no2/siemens_editorial_0613.htm It is not addressed in detail in this paper for space reasons and because some of the papers are theoretical in nature. However, readers are still encouraged to review the papers in the special issue.
- ⁵⁶ <http://nation.time.com/2013/09/12/all-hail-moocs-just-dont-ask-if-they-actually-work/>
- ⁵⁷ <http://www.moocresearch.com/>
- ⁵⁸ McAuley, A., Stewart, B., Siemens, G., & Cormier, D. (2010). *The MOOC model for digital practice*. https://oerknowledgecloud.org/sites/oerknowledgecloud.org/files/MOOC_Final_0.pdf
- ⁵⁹ <http://www.qualtrics.com/press/press-releases/qualtrics-and-instructure-partner-reveal-top-motivations-for-mooc-students/>
- ⁶⁰ http://www.sjsu.edu/chemistry/People/Faculty/Collins_Research_Page/index.html
- ⁶¹ Breslow, L. B., Pritchard, D. E., DeBoer, J., Stump, G. S., Ho, A. D., & Seaton, D. T. (2013). Studying learning in the worldwide classroom: Research into edX’s first MOOC. *Research & Practice in Assessment*, 8, 13–25.

Endnotes (cont.)

- ⁶² Cannesa, E., & Pisani, A. (2013, June 26). High school open on-line courses (HOOC): A case study from Italy. *European Journal of Open, Distance and E-Learning*. Retrieved from <http://www.eurodl.org/?article=572>
- ⁶³ <http://www.opendante.it/>
- ⁶⁴ <http://www.openeya.org/openeya/>
- ⁶⁵ Liyanagunawardena, T. R., Adams, A. A., & Williams, S. A. (2013). MOOCs: A systematic study of the published literature 2008-2012. *The International Review of Research in Open and Distance Learning*, 14(3), 202–227.
- ⁶⁶ A survey was published on MOOC trends in higher education. A similar survey would be useful for K-12 education. <http://www.edudemic.com/mooc-adoption-infographic/>. Readers should also reference an iNACOL Research in Review Webinar hosted by Verena Roberts of the ADLC (Alberta Distance Learning Centre) and Valarie Irvine of the University of Victoria. (<https://sas.illuminate.com/site/external/jwsdetect/playback.jnlp?psid=2013-06-18.1224.M.BA4CBBADE376B5D7D50B2DEB22D204.vcr&sid=253>). More of Verena Roberts' work on K–12 MOOCs in Canada can be found at: http://www.hybridpedagogy.com/Journal/files/MOOCifying_K-12.html
- ⁶⁷ <http://www.economist.com/news/business/21582001-army-new-online-courses-scaring-wits-out-traditional-universities-can-they>
- ⁶⁸ <http://gigaom.com/2013/09/03/star-coursera-prof-stops-teaching-online-course-in-objection-to-moocs/>
- ⁶⁹ http://www.bogost.com/writing/moocs_and_the_future_of_the_hu.shtml
- ⁷⁰ http://www.bogost.com/writing/moocs_and_the_future_of_the_h2.shtml
- ⁷¹ <http://www.fldoe.org/GR/pdf/2013/hb7029.pdf>
- ⁷² de Waard, I., Koutropoulos, A., Özdamar Keskin, N., Abajian, S. C., Hogue, R., Rodriguez, C. O., & Gallagher, M. S. (2011). Exploring the MOOC format as a pedagogical approach for mLearning. Proceedings from mLearn.
- ⁷³ Mackness, J., Waite, M., Roberts, G. & Lovegrove, E. (2013). Learning in a small, task-oriented, connectivist MOOC: Pedagogical issues and implications for higher education. *The International Review of Research in Open and Distance Learning*, 14(4). Retrived from <http://www.irrodl.org/index.php/irrodl/article/view/1548/2636>
- ⁷⁴ <http://www.mivu.org/LinkClick.aspx?fileticket=xgJoAeC0hCo%3d>
- ⁷⁵ Ito, M., Gutiérrez, K., Livingstone, S., Penuel, B., Rhodes, J., Salen, K., Schor, J., Sefton-Green, J., & Watkins, C. (2013). Connected learning: An agenda for research and design. Digital Media and Learning Research Hub. Retrieved from http://dmlhub.net/sites/default/files/ConnectedLearning_report.pdf
- ⁷⁶ <http://connectedlearning.tv/connected-learning-principles>

Endnotes (cont.)

⁷⁷ Image 4 is a partial representation of an infographic available at: <http://connectedlearning.tv/infographic>

⁷⁸ <http://www.macfound.org/programs/digital-badges/>

⁷⁹ <http://openbadges.org/>

⁸⁰ See a further discussion: Glover, I. (2013). Open badges: A visual method of recognising achievement and increasing learner motivation. *Student Engagement and Experience Journal*, 2(1).

⁸¹ <http://www.opencontent.org/definition/>

⁸² <http://creativecommons.org/>

⁸³ <http://rcnnolly.wordpress.com/2012/07/16/what-moocs-can-teach-us-about-community-outreach/>

⁸⁴ Readers who wish to learn more about MOOCs can follow a MOOC on MOOCs: <http://www.mooomoo.com/>; Also see the Chronicle of Higher Education's collection of MOOC material: <http://chronicle.com/article/What-You-Need-to-Know-About/133475/>

⁸⁵ <http://www.theatlantic.com/business/archive/2012/07/the-single-most-important-experiment-in-higher-education/259953/>

⁸⁶ http://www.slate.com/articles/technology/future_tense/2013/07/moocs_could_be_disastrous_for_students_and_professors.html

⁸⁷ <http://bostonreview.net/us/much-ado-about-moocs>

⁸⁸ <http://cacm.acm.org/news/161091-brown-mooc-to-lure-high-school-students-to-stem/>

⁸⁹ <http://net.educause.edu/ir/library/pdf/PUB4005.pdf>

⁹⁰ http://www.hybridpedagogy.com/Journal/files/Unmapping_the_Terrain_of_Digital_Pedagogy.html

⁹¹ <http://tomwhitby.wordpress.com/2013/04/18/am-i-who-i-say-i-am/>



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