

Volume 27 Issue 3

cjsae

the canadian journal for the study of adult education

la revue canadienne pour l'étude de l'éducation des adultes

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For the Adult Learning Landscape

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*The Canadian Journal for the Study of Adult Education/
La revue canadienne pour l'étude de l'éducation des adultes*
Editor-in-Chief: Donovan Plumb
www.cjsae-rceea.ca

27,3 June/juin 2015, 65–82
ISSN 1925-993X (online)

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L'Association canadienne pour l'étude de l'éducation des adultes
www.casae-aceea.ca

BIG HAT AND NO CATTLE? THE IMPLICATIONS OF MOOCS FOR THE ADULT LEARNING LANDSCAPE

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Abstract

Massive open online courses (MOOCs) are a relatively new form of education, offered by some of the best-known universities and attracting many hundreds of thousands of students. The authors describe MOOCs and the claims made about them and analyze two major impacts of these programs based on the first MOOC offered by McGill University. The first impact is the potential for expanded access to education offered by MOOCs, which this analysis finds to be more limited than often claimed. The second is the potential for radical educational practice in MOOCs, which is considered through the lens of andragogy. The authors find indications of interesting possibilities in this area, though they are not being exploited as fully—or as deliberately—as they could be.

Résumé

Les MOOCs (Massive open online courses), une forme d'éducation relativement nouvelle offerte par plusieurs des universités les plus connues, attirent des centaines de milliers d'étudiants. Ayant offert une description des MOOCs et des affirmations à leur sujet, les auteurs analysent deux effets majeurs de ces programmes en s'appuyant sur le premier MOOC qu'offre l'Université McGill. Le premier effet est le potentiel des MOOCs pour élargir l'accès à l'éducation, potentiel que cette analyse trouve plus limité que l'on le prétend. Le deuxième effet est le potentiel des MOOCs pour développer des

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pratiques éducatives radicales, potentiel que cet article étudie du point de vue de l'andragogie. Selon les auteurs, il y a des possibilités intéressantes dans ce domaine, mais elles pourraient être explorées plus profondément et plus attentivement.

Introduction

They have a saying in Texas: "big hat and no cattle." It's used when somebody makes big claims that they are unable to back up. When it comes to massive open online courses (MOOCs), there are certainly many big claims. The question that this article tries to address is whether any cows are accompanying the Stetson.

To many adult educators, the discourse that surrounds MOOCs is quite familiar. The claims boil down to the idea that MOOCs will create a revolution in access to learning. Anybody, anywhere in the world, will be able to take a course from the best global institutions (for free!). Setting aside some profound questions about the identity of the best institutions, the basic argument may remind adult educators of the promotion of online learning, of distance education, of study circles, and so on. More subtle arguments surround MOOCs concerning the possibilities of the technology. For example, marked assignments can be managed by artificial intelligence-based marking systems, making very large enrolments manageable. For courses with a more collective orientation, Internet tools now allow shared work to be undertaken and published easily and quickly. The argument is that profound learning on the Net is possible and can be done well.

Purpose

As researchers and instructors deeply involved in adult learning, we find the claims made for MOOCs intriguing. Our aim is to examine some of these claims using original empirical data from the first MOOC offered through McGill University in Montreal: *CHEM181x Food for Thought*. The analysis cannot be definitive, as we are looking only at one example; nonetheless, it offers useful insights into the potential of MOOCs as a mode for adult learning. We look at two claims made by proponents of MOOCs, as will be discussed more fully later. The first is that MOOCs substantially enhance the accessibility of higher-education learning, primarily geographically but also economically and to people who would not traditionally be able to meet entrance requirements. The second is that MOOCs offer a fundamentally innovative form of learning to participants. We address these points using a mixture of system data derived from the MOOC platform and responses to a survey built into the MOOC itself.

Our final analysis is that MOOCs are as complicated and diverse as any other form of education, and that simple statements regarding their potential should be avoided. Many of the aspects of learning through MOOCs that receive attention are well known to adult educators, even if they appear as innovations to higher-education institutions. The notion that MOOCs may support a shift in higher education toward methods based in adult learning theory is certainly welcome. But MOOCs also offer some interesting insights for adult learning; even if they do not continue in their present form, they may influence our understanding of how—and what—adults are interested in learning.

MOOCs: The Story So Far

The meaning of MOOC is spelled out within the name itself. They are, firstly, massive. This means that many thousands of people can take courses simultaneously; the biggest single course at the time of writing involved about 200,000 learners. The management of this number of participants is a key consideration in the design of the courses. The first *O* refers to “open,” meaning that participation in the courses is not restricted by geography, age, student status, or money. The courses are free and freely available provided that the participant has the necessary computer and connection. The second *O* stands for “online.” MOOCs are exclusively Internet-based courses, usually delivered through a custom portal such as edX or Coursera. Finally, the *C* refers to “courses.” In summary, MOOCs are online courses that serve many thousands of people simultaneously.

There are different types of MOOCs. Some are constructed by participants bringing various forms of content to the course; these are referred to as “cMOOCs,” with the small *c* indicating “connectivist.” This early form of MOOC arose in Canada around 2009–10. In some ways, cMOOCs are reminiscent of study circles, with learners shaping the course. The second type of MOOC is known as an “xMOOC” and is far more structured. Typically, an xMOOC has a series of video lectures, sometimes with assessments for each one, followed by a final test. xMOOCs are more formal and more reminiscent of conventional online courses. The xMOOC versus cMOOC divide is not always absolute, but most MOOCs tend to be at one end of the spectrum.

Within two years of their appearance, MOOCs became more institutionalized. The degree to which this has occurred is demonstrated by what is considered to be the most pressing question facing MOOC providers—what the business model should look like (Haggard, 2013). Though cMOOCs continue in some settings, the dominant form of MOOC is now the xMOOC, usually delivered by high-profile American institutions. The advantage for these institutions has never been clearly defined, but MOOCs are often associated with brand building and the opportunity for resource-efficient teaching (Masi, 2013). Many early comments about MOOCs contained statements such as “173,810 students. That’s more students than have enrolled in Vanderbilt’s history. 170k new members of the Vanderbilt community. They’re not paying tuition. But their presence counts” (Bruff, 2013, p. 21).

The status of MOOCs appears to reflect that of the founding institutions. The names associated with cutting-edge MOOCs are the universities who got in early: Stanford, MIT, and Harvard. The consortia they have built—edX, Coursera, and Udacity—have become the standard destinations for finding a MOOC, though many more consortia are available, with some serving speakers of languages other than English. To give an idea of the scale, in the first year of HarvardX and MITx MOOCs (later combined in the edX consortium), 841,687 people registered for courses. At the same time, a common framework for MOOCs has started to emerge, with video lectures, discussion groups, and online tests that can be graded by machine (multiple choice, keywords, and so on).

The consortia are brokers and hosts for MOOCs. The consortium hosts the course, covers the cost of the considerable bandwidth, and provides infrastructure such as the platform, marketing, registration, and basic student support. Institutions provide the content and the technical resources to prepare it for uploading. The videos (the most bandwidth-intensive part of a MOOC) are actually hosted on private, non-searchable YouTube channels. Institutions pay considerable sums of money to the consortia for the services they provide,

and they have to pay for development, video production, professorial time, and so on. While MOOCs are most often free at the point of consumption, the cost of production can be several hundreds of thousands of dollars. While this is mitigated by the reusability of MOOC content, universities cannot afford to sink enormous amounts of resources in MOOCs with no return. This underlies the growing interest in charging for certification in a model where the course is free, but participants pay for a verified "certificate of completion." This approach provides a partial answer to the search for a business model, but it has not yet been demonstrated to be truly viable.

Claims Made for MOOCs

Promoters of MOOCs have made a series of statements about their potential to change the nature of education, particularly higher education. One claim is that MOOCs are a potentially powerful rationale for institutions in an era when the relevance of higher education is being questioned: if hundreds of thousands of people around the world are taking courses at your university, it becomes far easier to argue for community engagement and global contribution.

Many of the claims regarding MOOCs arise from cMOOCs in particular and focus on the ability of a large number of people to come together to shape their own learning. Educators who have been working on MOOCs since the earliest days (for about six years at the time of writing) often emphasize the collective and community aspects. For many of these educators, credentials and assessment are not particularly important; the key point is to participate in a collective process (Downes, 2011). cMOOCs have the potential to offer deeply constructivist forms of learning that could shake educator-centric models of mass learning.

xMOOCs are also seen as having the potential to affect higher education; they are often described as "disruptive" (Hill & Feldstein, 2013, p. 5). There are two arguments in this case. The first is that MOOCs provide access to people who would never usually take part in higher education. The dimensions here are geography, economy, and educational background; individuals from developing countries who cannot afford to travel to the West for university, or who may not have the credentials for entry, can access the best teaching and content in the world. Setting aside the implicit colonialism of this view, there are some potentially exciting possibilities.

The second area of disruption concerns teaching practices. MOOCs can be part of a move to flip the classroom, with students accessing content outside of the class and spending class time discussing, analyzing, and applying that new information. MOOCs could encourage team-based teaching, where the knowledge of any one individual becomes an open resource for teaching and learning. Another potential disruption concerns the number of people that can be served by a single course. The ability for a large university to deliver a first-year course through a MOOC and attain learning outcomes comparable with a lecture would realize considerable savings in professorial time, teaching assistants, and accommodation; students would also benefit from the greater flexibility. A MOOC video can be watched over and over again at 2 a.m., which is harder to do with a live professor. As one commentator stated, "If students anywhere can take a for-credit course designed and taught by an Ivy League superstar, for a fraction of the equivalent's cost at a local college, a whole new economic logic and competitive landscape emerge" (Masi, 2013, p. 5).

These possibilities rely on a means to transfer credits between MOOCs and formal higher education, a challenge that has not yet been resolved.

It is an open question whether MOOCs will lead to a new democratization of knowledge, as hoped for by the first developers, or will end up replicating the structures of conventional higher education. One way to look at this, given the focus on adult learners within MOOCs, is to approach MOOCs through the lens of adult education.

MOOCs and Adult Education

In reviewing the literature about MOOCs, we are struck by how similar the issues are to those of adult education. For example, the participants are generally older than those in traditional initial schooling, they are self-selecting, and questions of motivation are very important. Like contemporary adult education, there is tension around the aims and methods of the provision. Is the goal critical engagement in knowledge creation, preparation for further study, or readiness for employment? What sorts of approaches are effective and respectful to use with adult learners? Who should be making the critical decisions about what is learned and how it is communicated? The answers to many of these questions are unclear; MOOCs, like any educational approach, are fundamentally agnostic, and it is application that defines their potential. Nonetheless, given the strength of the claims made for MOOCs, it is important to assess the evidence supporting these claims in order to inform our collective thinking about this new phenomenon.

The first category of claims for MOOCs centres on issues of access. When discussing these claims, we take the position that increased access to educational opportunities is a fundamental value of adult education. By increased access, we do not mean that adult education exists to be a pipeline to higher education, but that adult education represents access to learning in and of itself (for a recent discussion of access and barriers, see Desjardins & Rubenson, 2013). When examining MOOCs, we are looking for an extension of participation beyond the groups who would traditionally engage with this topic and level of education.

The second range of claims about MOOCs focus on the potential for radical change in the educational process. Radicalism usually tends to be in the eye of the beholder, and this is certainly the case with MOOCs. For many adult educators, the notion of inclusive, student-centred educational processes that are voluntary and reliant upon the motivation of participants is not at all radical. The people who are writing most about MOOCs are technologists or higher-education faculty who may be coming from a different experience of teaching and learning and see these characteristics as a significant departure from their norms.

To frame the claims and the evidence from our study, we have chosen to work with a set of perspectives on adult learning that are well established within the field, even though they have been extensively challenged. Malcolm Knowles (1980) tried to define adult education systematically for several decades through the concept of andragogy. While the concepts he defined can appear dated and contextually limited when considered as a learning theory (St. Clair, 2002), they represent a set of central values that remain meaningful for many educators. In our experience, they are an effective and clear way to help new adult educators understand what defines adult education. They cannot be applied unreflectively, but they do provide a useful starting point for a more personal and descriptive framework for practice.

The first of Knowles's four principles is the concept of the learner (this discussion relies heavily on Knowles, 1980). Whereas in initial education the tendency has been to view learners as being dependent on the teacher, in andragogy there is a fundamental assumption that learners are in the process of moving toward independence and self-direction. Many adults make many difficult decisions every day as parents, workers, and community members, and there is an expectation that this degree of self-management will manifest in learning settings. The implication is that learners can play an active role in shaping their learning processes and defining the outcomes that are most valuable for them.

The second principle recognizes adults' growing reservoir of experience. Even when learning about a topic that is new to them, adults have a repertoire of strategies and approaches to learning that they have found valuable and effective. Knowles (1980) argues that respectful work with adult learners requires acknowledging and finding ways to apply this experience. Using experience as a resource validates the learners' lives and can provide invaluable content for class discussion and processes.

The importance of understanding learners' readiness to learn is the third principle. This is similar in some ways to the idea of the teachable moment, which suggests that there is a time when learners will be most receptive to a new idea or information. Adult learners tend to be ready to learn specific things at certain stages in their development. This is not to suggest that every person at a certain age or point in their life will be ready to learn the same thing; it is a reminder that each individual needs to have reached their own point of readiness for effective learning to occur.

The final principle is orientation to learning. Adult learning is driven directly by a learner's need to know, Knowles (1980) claims. Though it is easy to overstate this principle, the central idea is simple: motivation to learn arises when the learner sees that learning could be useful. It does not matter if that utility is immediate or longer-term; the key issue is whether the learner can see potential application.

Pulling together these four principles creates a relatively straightforward but potentially useful way to generate questions about adult learning contexts. These could include the extent to which the setting respects and uses experience, the degree to which adults can manage their own learning, and the assumed motivation for participation.

In analyzing MOOCs, we found that these principles helped us to understand the extent to which MOOCs genuinely offer a form of learning different from most formal education settings. If MOOCs are consistent with these principles, they may well be compatible with some of the central values of education for adults. If not, further and deeper questions need to be asked about how radical the pedagogical potential of MOOCs may be, or whether they fit the norms of formal higher education.

The Current Study: Context and Methods

Educational research on MOOCs remains in the very early stages. Partly this is because of how recently they were first offered. Other possible reasons include the relatively limited involvement of educational specialists in the development of MOOCs—as mentioned earlier, computer specialists played a much larger role in their development than people with a research background in teaching and learning. Perhaps the most significant factor slowing research is the difficulty of data extraction and analysis.

The CHEM181x course at the centre of the current discussion was medium-sized, starting out with some 32,000 registrants. Of these, around 9,000 were active in the course

and just over 1,600 achieved a “pass.” The MOOC was offered on the edX platform. The volume of data that this number of participants creates is unimaginable to those who have not seen it. edX was designed not to provide clean data on educational questions, but to be an efficient and robust platform for delivering content. Output data tends to come in a form that is tricky to handle. The answer to one test question might be buried in an entire page of computer code, requiring sophisticated filtering and sorting routines to extract that specific piece of information. When this is multiplied by the hundreds of items that we might want to know about, the challenge becomes profound. Questions that seem very simple to educators, such as “how long did the average student log on to the course?,” are actually very difficult to get out of the software. It takes many months to condition the data in order to answer meaningful questions.

One challenging aspect is that people can access as much of a MOOC as they want, meaning that it is unclear what completion means. That is the whole point of an open course. This prevents a series of questions from being asked, such as whether a particular pattern of engagement with the course is more likely to lead to “success.”

Due to these issues, current data on MOOCs can appear rather shallow from an educational perspective, but this would be unfair. Educational researchers are only starting to make sense of these courses and the data they generate, and the sophistication of future approaches will increase. The issues are illustrated by the first-year report from HarvardX and MITx (Ho et al., 2014), which was long-awaited by MOOC researchers as potentially offering a new level of analysis conducted by technologically smart investigators in well-established MOOC hubs. In fact, the report was almost entirely demographic and provided few insights into learning and teaching aspects of the courses. The authors state that “course certification rates are misleading and counterproductive indicators of the impact and potential of open online courses” (p. 2). Across the first 17 courses offered, 5.1% of registrants achieved a certificate, which is in line with most MOOCs. However, the remaining 94.9% (some 792,000 registrations) showed a huge variety of interaction with MOOCs, from working through every component except the tests, to dropping in to one or two favourite lessons. Demographically, 29% of participants were female, 33% had less than high-school education, 6.3% were over 50, and 2.7% were from locations on the UN list of Least Developed Countries.

In the current study, the research team wanted to move further into analysis of teaching and learning in the MOOC environment. Our approach to this study was to use empirical data from two sources to inform a comparative evaluation analysis (Vartiainen, 2002). In essence, we gathered data, mostly quantitative, and evaluated their fit with what we would expect to find if the major claims we were testing were credible.

The first source was system statistics generated by the edX platform. As with any consortium learning platform, edX collects vast amounts of information on every user and every one of their transactions on the system. In this early analysis, we looked primarily at demographic data from the 32,205 course registrants.

The second tranche of data came from two surveys built into the MOOC. As we are educational researchers and were involved in the development of the MOOC from the earliest stages, we were able to implement both entrance and exit surveys for MOOC participants (voluntary for them to complete and without implications for their progress in the course). There were 9,623 entrance survey respondents, representing 29.9% of the initial 32,205 registrants. We refer to these respondents as the entrance group. For the next two

groups, we included only people who completed the entrance survey, so there is baseline data on them. The first is the 1,608 people who passed the course, meaning that they had a score of 60% or more and were entitled to claim a certificate. The second is the exit group, the 1,484 respondents who completed the exit survey. About 78% of the pass and exit groups overlap—that is, they attained 60% and completed the exit survey.

Despite the caution from Ho et al. (2014) regarding certification rates, we do discuss them here. We have elected to include them as variables not because we believe they are necessarily valuable in their own right, but as a proxy for motivation and commitment. We see them as proxies for slightly different forms of these qualities—pass is dependent on the participant completing quizzes and questions and electing specifically to follow this route, and exit demonstrates a voluntary commitment to the course and the research agenda. We use the language “persistence to pass” to underline our caution about taking a passing score as a universal goal or signal of anything more than the fact that people invested a certain level of time and effort. For reasons of brevity, we have adopted the idea of engagement to summarize these factors; in our view, persistence to pass and/or completion of the exit survey reflects a significant level of engagement with the MOOC. In the analysis that follows, we are careful to avoid discussion of the people who chose not to be in the pass or exit groups, as we know little about them.

Findings on Access

On the issue of access, the key consideration is the extent to which CHEM181x attracted a broader participant group than would typically be the case for such a course. Due to the nature of MOOCs, it can be anticipated that the background of participants will differ from a face-to-face undergraduate course; the issue is whether the difference is substantial enough to provide a rationale for the expense and complexity of MOOCs.

Table 1 shows the top 10 locations of the people who answered the entrance survey, as well as their outcomes. Respondents mentioned 157 countries, of which 28 had more than 50 respondents. The top three—the United States, Canada, and the United Kingdom—made up 48.3% of the respondents, and these are the countries in the world with the biggest English-speaking populations. It is interesting to note that a developing economy—Brazil—is in the top 10. A large number of countries had only one, two, or three respondents, so the frequency curve falls quite steeply after the top 10.

Table 1: Ten Most Frequent Countries of Origin of Entrance Survey Respondents

Country	Total number	Pass rate (%)	Exit survey rate(%)
United States	2,722	15.6	16.9
Canada	1,596	16.2	15.9
United Kingdom	330	17.0	18.5
India	308	15.9	16.2
Spain	225	24.0	24.9
Mexico	189	20.1	22.8
Australia	188	16.0	17.6
Germany	156	11.5	18.6
Brazil	130	15.4	19.2
Netherlands	122	23.0	26.2

For the 9,623 respondents to the entrance survey, the pass rate was 16.7% and the exit survey completion rate was 15.4%. Table 1 shows considerable variation from these figures. Including the countries not shown in Table 1, the country with the highest pass rate was Greece, with 34.4%; this same country had the highest exit survey rate, at 38.9%. Next were Singapore (29.6%, 27.8%), Argentina (24.1%, 22.2%), Spain (24.0%, 24.9), and the Netherlands (23.0%, 26.2%). It is notable that English is not a first language in these countries, suggesting that there is a strong motivation at work here. To provide context for these figures, the lowest rates came from participants in the Philippines, with 9.5% on both measures. In three countries, the rate of exit survey completion was far higher than the pass rate. In Poland (15.1%, 24.4%), Germany (11.5, 18.6%), and Japan (15.4%, 21.2%), approximately 50% more people completed the exit survey than passed the course.

One key accessibility factor is gender. As shown in Table 2, just over 60% of participants who initially registered were female, and they persisted to pass 1.25 times as frequently as male participants. The net effect of these two factors was that the number of women persisting to pass was almost twice the number of men. While there is no evidence that MOOCs are a silver bullet for gender disparities in education, the data suggest that they are well utilized by female learners.

Table 2: Participation and Persistence to Pass by Gender

	Total		Pass rate (%)
	n	%	
Female	17,978	60.4	6.0
Male	11,763	39.6	4.8
Total	29,741	100	5.5

The age distribution of participants was telling. The notion of the “digital native” (Prensky, 2001) would suggest that younger people might take more easily to online learning due to their higher comfort with technology. This is indeed the pattern in the data, with almost two-thirds of initial registrants under the age of 35. The pattern is strikingly different when considering persistence to pass, however, with Table 3 showing higher pass rates for older participants.

The rate of persistence to pass is very strongly positively correlated with age, with the highest persistence among 56- to 65-year-olds and the second highest among 46- to 55-year-olds. The digital native generation has a much lower persistence rate than people over 65. Given the initial age distribution among registrants, the highest absolute number of people who persisted is still found in the 26–35 group, but, for example, a 26-year-old was 2.5 times less likely to persist than a 56-year-old. This suggests that when older adults are attracted to MOOCs, they stick with them, signalling that MOOCs might support engagement in older learners.

Table 3: Participation and Persistence to Pass by Age

Age	Total		Pass rate (%)
	n	%	
0–15	201	0.7	2.5
16–25	7,417	26.9	3.2
26–35	10,113	36.7	4.5
36–45	4,227	15.4	7.4
46–55	2,773	10.1	10.9
56–65	1,806	6.6	11.5
65+	986	3.6	7.6
Total	27,523	100.0	5.8

For the rest of this section, discussion is based not on the people who initially registered but on those who completed the optional entrance survey. People had to volunteer to complete the survey and then complete several pages of questions. Given this, we were delighted that around 9,623 participants (depending on the question) were willing to do so, and we believe that the positive opt-in adds validity to the data. Note, however, that pass rates increase for this group, since the people who completed the entrance survey were far more likely to complete the exit survey and persist to pass than the registrants as a whole.

Language is an important consideration in analyzing the international reach of the MOOC. In the case of CHEM181x, 91.9% of survey respondents had studied in English, and these participants were slightly more likely to persist to pass (17.9% vs. 17.2%) and to complete the exit survey (16.7% vs. 15.2%). Similarly, 91.6% of respondents had used English regularly in the past year, and again this made little difference in the pass rate (18.0% vs. 17.8%) and exit survey completion (16.9% vs. 16.5%). The most likely explanation for these results, we believe, is that there is significant self-selection at work; people who were not confident of their English did not get involved in the course.

Table 4: Enjoyment of MOOCs for Participants Who Had Taken a MOOC Before

	Total		Pass rate (%)	Exit survey rate (%)
	n	%		
1 — I didn’t enjoy it	114	3.1	14.9	14.0
2	292	7.8	14.4	13.7
3	993	26.6	17.5	15.5
4 — I really enjoyed it	2,332	62.5	26.0	22.6
Total	3,731	100.0	22.5	19.8

The survey asked if participants had taken a MOOC before. Just under two-thirds (62.4%) had, and these participants were considerably more likely to persist to the exit survey (20.0% vs. 13.4%) and to pass (22.7% vs. 13.8%), indicating there is some advantage in knowing what you are getting into. Participants who had taken a MOOC before were also asked how

much they enjoyed the previous MOOC (Table 4). Here, 62.5% said that they had “really enjoyed it,” and these respondents were considerably more likely to persist to the exit survey and to pass. The corollary is that it is less likely that somebody without experience in a MOOC will persist.

Education is one of the strongest predictors of further study—those with education tend to keep participating in education (Desjardins & Rubenson, 2013). One strong indicator of the impact of MOOCs on educational accessibility would be a good proportion of people taking the course with less than the conventional entrance qualifications. As shown in Table 5, the majority of people taking CHEM181x and continuing to pass or complete the exit survey were highly educated—86.1% of participants had at least a high-school education, which would be the conventional requirement for this course (which was seen as equivalent to a first-year university course). Pass rates and exit survey rates are fairly consistent across educational background, but do show a lift in the categories above high school. Participants were more likely to persist with the MOOC if they already had the approximate MOOC target level of education. This finding raises questions about the effects of MOOCs on educational accessibility—most people who get involved are already highly educated, and they tend to persist somewhat more.

Table 5: Persistence to Pass or Exit Survey by Education Level

	Total		Pass rate (%)	Exit survey rate (%)
	n	%		
Did not attend school	8	0.1	25.0	25.0
Some primary schooling	1	0.0	0.0	0.0
Elementary, primary school, or equivalent	13	0.2	15.4	7.7
Junior high, middle school, lower secondary school	100	1.2	11.0	13.0
High school, upper secondary school, or equivalent	1,068	12.4	13.9	12.5
Technician’s diploma, basic technical/vocational education	324	3.8	17.6	16.4
Higher technical/vocational education, associate’s degree, or equivalent	600	7.0	17.8	16.7
Bachelor’s degree, first university cycle, or equivalent	3,060	35.5	16.9	15.5
Professional degree, master’s degree or equivalent	2,835	32.9	19.6	18.2
PhD/doctoral degree or equivalent	604	7.0	22.4	21.4
Total	8,613	100	17.8	16.5

We were also interested to know if the participants in CHEM181x had ever studied chemistry before. The responses show that only 13.3% of the respondents had not previously studied chemistry. This made little difference to persistence to pass or exit survey completion unless the respondents had previously studied chemistry in university or college. People who had studied at the college level had a persistence to pass rate of 20.7% compared to the average of 17.8%, and an exit survey completion rate of 18.5% compared to the average of 16.5%. The clear message is that having a background in the field supported persistence.

Many of the participants were engaged in work that they considered to be related to the topic of the course. Altogether, 25.9% responded positively to the question of whether they worked in chemistry, nutrition, or another related field (Table 6). This involvement made them slightly more likely to persist in the course, both to the pass point and completion of the exit survey. Those working in the field at the high-school/secondary-school level were not markedly more likely to demonstrate increased engagement, but 3.7% more people completed the exit survey if they worked in the field at the college/university level compared to those who did not work in the field.

Table 6: Persistence to Pass or Exit Survey Based on Work in Chemistry, Nutrition, or Another Related Field

Work	Total		Pass rate (%)	Exit survey rate (%)
	n	%		
No related work experience	6,369	74.1	16.0	17.1
Yes, at high-school/secondary-school level	418	4.9	15.3	17.9
Yes, at college/university level	872	10.1	18.0	20.8
Yes, elsewhere	939	10.9	19.2	20.4
Total	8,598	100.0	16.5	17.8

We gathered information about two more aspects of participants' engagement with the MOOC: where they proposed to study the course and what sort of device they would use. If the MOOC altered access to learning, we would see learning distributed across both location and the devices being used. In the case of learning site, 94.9% of respondents studied at home, and 70.5% studied the course only at home (these were multiple response questions, indicating who mentioned a location or a device and who mentioned *only* that location or device). The second most popular response was at work (17.8%, 2.7%), followed by public settings like cafés (13.0%, 0.8%) and on campus (5.8%, 1.2%). The message from these figures is that the MOOC moved learning off campus and that the dominant destination was individuals' homes. The most popular devices were laptop computers, mentioned by 70.6% of respondents and exclusively by 40.1%. Desktops were next, with 38.3/16.8%, then tablets with 26.0/4.9% and smartphones with 15.7/0.7%. The implications of both of these findings is that learning involved a fair degree of capital—most people could afford both a laptop and home Internet in order to participate.

Table 7: Persistence to Pass or Exit Survey by Frequency of Social Media Use

	Total		Pass rate (%)	Exit survey rate (%)
	n	%		
Never	1,092	12.2	21.8	22.4
Occasionally	1,631	18.2	18.0	16.7
Once a week	495	5.5	19.6	17.8
Several times a week	2,378	26.5	17.2	16.1
Several times a day	3,387	37.7	15.0	13.4

Finally, we asked participants about their social media use. The “total” column in Table 7 shows that there was some division when it came to social media use, with around one-third using social media occasionally or never and two-thirds using them several times a week or several times a day. Our prediction was that use of social media would assist with persistence in a MOOC—in fact, the opposite was the case, with both pass and exit survey rates declining as social media engagement increased. The data suggest that use of social media did not support engagement with this MOOC, which was a counterintuitive finding hinting at the possibility that people who are not necessarily heavy Internet users are attracted to MOOCs.

Overall, our findings do not support a strong argument that MOOCs are meaningfully increasing access to education for adults. The people who started the course were self-selected people who had confidence in their English skills and who had high levels of education, including chemistry. There is some limited evidence that female and older learners tended to demonstrate more engagement in this case. And there is evidence that the participants were geographically diverse. While these results suggest MOOCs do support a diverse learner population, they do not support the notion of profound changes in access to learning.

Findings on Learning and Teaching

The data related to the pedagogic (or andragogic) potential of MOOCs are limited, but they do raise important questions. In this section, the relevant data are presented and then discussed in terms of the four andragogical principles referred to earlier. The data are derived from the entrance and exit surveys.

One interesting factor, reflecting the emphasis on group work often found in adult education (St. Clair, 2015), is the extent to which people work collectively or independently. While cMOOCs emphasize collective learning, xMOOCs like CHEM181x and most of the edX portfolio tend to be more individualistic. Participants were asked whether they knew someone else who was taking CHEM181x (Table 8). If they stated that they did, they were slightly more likely to persist to pass (19.7% vs. 17.0%) and to complete the exit survey (17.7% vs. 15.9%). However, the vast majority of participants (94.3%) worked completely on their own.

Table 8: Intentions in Taking CHEM181x

Goals	Total		Pass rate (%)	Exit survey rate (%)
	n	%		
I am just visiting	180	8.3	8.3	4.4
I am only interested in some topics in this course	799	7.0	7.0	7.0
I am planning to audit the course only	2,133	9.2	9.2	6.0
I am considering, but not committed to, earning a certificate	3,011	16.1	16.1	17.8
I am committed to doing all of the work to earn a certificate	2,821	24.2	24.2	28.8
Total	8,944	16.0	16.0	17.2

Table 8 shows the intentions people had when they registered for the course and the proportions of each group who persisted to the pass and exit survey stages. The highest rates of persistence to pass and exit are found among those who originally intended to do all the work to earn a certificate. Around 1.5 times as many members of this group persisted as the average.

Table 9: Reasons for Taking CHEM181x

	Total n	Pass rate (%)	Exit survey rate (%)
Personal challenge	5,384	18.0	16.0
Certificate/credential given for successful completion	1,731	28.9	23.3
Increase in knowledge and skills	6,820	18.4	16.6
Social community of the course	387	18.1	16.8
Interest in topic	7,067	17.9	16.4
Entertainment value of the class	1,014	19.8	17.6
Review of chemistry/nutrition concepts	3,315	20.4	18.4
Employment/job advancement opportunities	1,090	22.1	19.1
Total	8,978	17.2	15.9

Table 9 looks at a related issue—the reasons people gave for taking part in the MOOC. In this case, respondents could give multiple answers, so there are no overall percentages. People who took the course for the certificate/credential were more likely to persist to pass

and complete the exit survey than others. It is notable that the second-highest pass and exit survey rates were found among people who mentioned employment as a motivation.

Table 10: Number of Reasons for Participating in CHEM181x

	Total		Pass rate (%)	Exit survey rate (%)
	n	%		
0	645	6.7	9.9	8.8
1	2,319	24.1	12.8	13.8
2	1,350	14.0	12.8	12.2
3	2,193	22.8	17.4	15.4
4	1,719	17.9	19.5	17.7
5	883	9.2	23.8	21.6
6	379	3.9	29.0	23.5
7	80	0.8	28.8	18.8
8	55	0.6	27.3	23.6
Total	9,623	100.0		

Table 10 presents a different look at the same data. Here we have laid out *how many* reasons people actually gave for taking the MOOC. Respondents could select from zero to eight reasons. The “total” column shows that most people chose one or three reasons. However, the persistence to pass and exit survey rates were considerably higher among those who gave five to eight reasons for taking the course.

Learner self-efficacy is a key component in learning. Table 11 shows the responses when participants were asked if they were confident that they could understand the most complex material presented. The “total” column shows that 75.6% of respondents agreed or strongly agreed that they were confident. However, the persistence rates do not reflect the initial level of confidence very strongly. It appears that there is some gradient across the categories (from 14.4% to 20.9% in the case of pass), but less than could have been anticipated. The MOOC format may be effective for learners with lower confidence and self-efficacy.

These data provide important insights about the congruence between the participants’ experience in CHEM181x and the principles of andragogy. There is clear evidence that participation in the MOOC involved a high level of independent learning, though working with another participant made more comprehensive engagement slightly more likely. The second principle is that adults bring experience to their learning. In the CHEM181x context, this can be seen in the way that MOOC experience is associated with greater persistence, as are working in the field and previous education in chemistry.

Table 11: Confidence about Ability to Understand the Most Complex Material Presented

	Total		Pass rate (%)	Exit survey rate (%)
	n	%		
1 — Strongly disagree (i.e., not confident)	436	5.1	14.4	13.5
2	1,654	19.3	14.6	14.8
3	3,584	41.7	17.2	15.9
4 — Strongly agree (i.e., very confident)	2,916	33.9	20.9	18.7
Total	8,590	100.0	17.8	16.5

Participants’ readiness to learn is arguably reflected in their decision to take the course, as well as their employment and study in related fields. A relationship between engagement and readiness to learn is demonstrated by the fact that higher engagement is related to a larger number of reasons for taking the course. At the same time, the lack of domination of any particular reason shows that the motivations for study are varied and personal. The high level of self-efficacy shown by participants also supports the notion of readiness to learn as a factor in engagement. The same arguments can be made with regard to orientation to learning. Participants were able to identify concrete reasons for study, though it is worth noting that intrinsic motivations such as “personal challenge” were less associated with high levels of engagement than extrinsic motivations.

Pulling together these strands, there is some evidence that MOOCs build engagement with learners who fit with Knowles’s adult learning principles. It does not follow that MOOCs offer a radically different context for learning, but our findings imply that the characteristics of MOOCs as a method for learning align well with the needs of certain adult learners.

Discussion

The primary question driving this discussion is what MOOCs might mean to adult education. As has been hinted at throughout this paper, the answer is complex. Based on the MOOC analyzed, however, we can state that the demonstrated impact on access for marginalized learners is limited. The evidence suggests that MOOCs are at least compatible with high levels of engagement (as demonstrated by persistence to pass and exit survey completion) by female learners and older learners, which is encouraging. In the case of older learners, the level of engagement does not, however, compensate for the lower absolute numbers.

Balancing the good news about engagement by older and female learners, there is little evidence that the reach of this MOOC went far beyond the traditional target group for a first-year university class. Respondents to our surveys were overwhelmingly well-educated people with strong English skills, home Internet connections, laptop computers, confidence in their learning abilities, and previous exposure to science education. In addition, people with these characteristics demonstrated higher engagement, suggesting that the MOOC suited this population. One contradictory finding was that greater use of social media did

not predict higher engagement, though this could be interpreted as an age-based finding— younger people both use social media more and were less likely to show high engagement.

In the data we analyzed, some elements suggested some congruence with adult learning theory. Participants were motivated by their work concerns and study history to engage with the course. The more reasons they had to become engaged with the course, the more engaged learners were, and learners' initial desires influenced their outcomes in the course. Overall, MOOCs could suit self-directed adult learners very well.

The utility of MOOCs centres on their openness. The ability of learners to self-enrol at no cost and then choose how to interact with the courses (from browsing all the way to certification) potentially makes them a very powerful medium for adult learning. It is easy to imagine them becoming a resource for groups setting out to study a topic together, for example. cMOOCs have perhaps even more potential, as group members would not even have to be in the same location and could build their course collectively. But again, the need for participants to be able to work with Internet resources beyond a basic level limits the reach of such a provision.

Conclusion

Our position remains based in the belief that MOOCs, like any educational approach, are shaped by the intentions of learners and instructors. If there is a well-thought-through attempt to provide learning for adults through MOOCs, it could be very successful, especially if the limits are kept in mind. However, the tendency of the structure to push back toward a more formal “broadcast” model of knowledge transmission, with a higher skills threshold for access, needs to be avoided. The big hat, it appears, may have a cow or two behind it, but we are still a long way from a decent-sized herd.

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