[Current Issues in Emerging eLearning](https://scholarworks.umb.edu/ciee)

Volume 6 | Issue 1 Article 2

12-20-2019

Learning Together in Public and in Private: Exploring Learner Interactions and Engagement in a Blended-Platform MOOC Environment

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LEARNING TOGETHER IN PUBLIC AND IN PRIVATE: EXPLORING LEARNER INTERACTIONS AND ENGAGEMENT IN A BLENDED-PLATFORM MOOC ENVIRONMENT

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How open can an open course be, when delivered on a closed platform? Even if barriers to participation are minimal, with registration requiring no more than a name and an anonymous email address, does the very act of requiring registration limit participation – and thus learning? Can the relatively closed platform of EdX work in tandem with more open, public platforms to maximize student participatory engagement and, if so, how?

Building on existing scholarship, the authors sought to understand how participatory learning in a MOOC was related to the platform employed. In designing and facilitating a short two-week MOOC, we engaged with Veletsianos (2017) in the implicit mandate to illuminate platform dynamics, towards the goal of improving student learning experiences. We built on scholarship in online and open learning to design a variety of engagement opportunities, (Bouchard 2009; Downes, 2012; McAuley, et al., 2010; Siemens 2012; Weller 2007), and then constructed measures of student learning and tested the degree to which various measures were related to platform of engagement. Moreover, we considered whether these measures vary due to learner positionality, which we operationalize across various axes of identity and social location – including gender, age, and educational attainment. Using data from our two-week Davidson NOW MOOC, "Participatory Engagement in Times of Polarization" (#engageMOOC), we used logistic regression models to compare posts made on Twitter with those made within EdX.

Our research findings suggest that, even after estimating the effects of learner age, gender and educational background on measures of participatory learning, the platform of engagement significantly predicts participatory interaction content. Users interacting on Twitter asked and answered more questions, utilized more of the course knowledge, networked course information to external sources, and engaged more often as experts and agents in their learning than they did when interacting on EdX. Even after accounting for differences in platform use that may be attributable to gender, age or educational attainment, these differences in participation remain significant and enduring.

MASSIVE OPEN ONLINE COURSES

Massive Open Online Courses (MOOCs) entered the mainstream education lexicon in 2011 and 2012, with the New York Times declaring 2012 to be the "Year of the MOOC" (Pappano, 2012). However, MOOCs did not originate as free content delivery under elite university brands such as Stanford or MIT. Rather, they emerged within higher education practitioner communities in the first decade of the 21st century, particularly in Canada. Early MOOCs, such as the 2008 University of Manitoba Connectivism and Connected Knowledge course, made course participation and course materials available to non-registered learners. These courses built indirectly on the sharing ethos established in MIT's Open Courseware Initiative and open source computing more generally, but focused on participatory and self-directed (Kop, 2011) – even self-determined – learning rather than on content, and on openness as transparent practice, permitting "educators and learners to participate in research, learning, and sense-making around a given topic" (p. 38, Cormier & Siemens, 2010).

Traditional learning environments have been dominated by the learning paradigm of knowledge and resource delivery. Communication within the course was understood as important mainly to the transmission of information to and between learners. Early MOOCs, in contrast, built upon pedagogical approaches that centered communications and networking as core to the learning process (Weller, 2007). 2008's "Connectivism and Connected Knowledge" both explored and modeled connectivism as a learning theory. In contrast to more hierarchically-oriented models of education, connectivist learning spaces are characterized by the core emphasis on connections and knowledge created among participants (Milligan, Littlejohn, & Margaryan, 2013).

This style of participatory MOOCs, focused on connection- and network-building, eventually became known as connectivist MOOCs or cMOOCs (Downes, 2012). The emphasis cMOOCs' place on networking knowledge shifts the focus of the role of facilitator to creating space for interactions among participants (Milligan, Littlejohn, & Margaryan, 2013). On the other hand, mainstream MOOC platforms such as EdX, Coursera, and Udacity, designated xMOOCs, have tended to use digital environments to expand the reach of traditionally elite sources of academic authority. While there are many overlaps between the two forms of MOOC, a core distinction is that xMOOCs focus on the delivery of predetermined course content over emergent knowledge creation or learner-to-learner connections (Stewart, 2013), while cMOOCs have emphasized distributed, participatory development of networked knowledge from within the participant group.

The #engageMOOC Team

The team involved in designing and facilitating #engageMOOC – and in researching the impact of platform on engagement in the course – came in part out of the Canadian tradition of MOOCs as participatory learning. One of the two facilitators had been involved with cMOOCs in Canada from their early years and saw MOOCs as ways of opening up learning opportunities to networked publics, without predefined expectations for participation (McAuley, Stewart, Siemens, & Cormier, 2010). The other facilitator had no experience with MOOCs, with no preconceptions regarding platforms or online learning formats, but had a broad demonstrated commitment to inclusive classrooms. The rest of the team included the Davidson NOW project lead and two student research assistants, all of whom were experienced in online and hybrid course delivery and open to the ideas of trying to use the institutional EdX platform to offer learning experiences that modelled the participatory focus of the course. Four of the team members were affiliated with Davidson College at the time of the MOOC, while one was not. The team anticipated that the course would draw both Davidson-affiliated participants and non-affiliated participants, particularly when promoted through the large open Twitter networks represented by some team members.

The #engageMOOC team were by no means the first to attempt to combine cMOOC pedagogical approaches with xMOOC platforms. The University of Edinburgh began offering the E-learning and Digital Cultures MOOC on Coursera in 2013, which included cMOOC-style practices and participatory activities such as peer evaluation. The Dual Layer MOOC (Crosslin & Dellinger, 2015; Crosslin, 2014) concept came out of an effort to create dual pedagogical pathways through an EdX MOOC in 2014. However, the #engageMOOC team did not see the course in terms of two distinct pathways, nor did we want to formalize peer engagement in a structured way. We were interested in creating a variety of possibilities within the structure of a short, two-week course structure. We did not feel this reflected the Dual Layer design format but rather was an extension of our varied understandings of the original cMOOC format, involving enabling various forms of participation from which learners can choose at their convenience. We recognized that given the minimization of barriers to participation in open course spaces, learners in both xMOOCs and cMOOCs may register out of curiosity or interest in knowledge acquisition or sharing, rather than preoccupation with completion of a degree (Stewart, 2013). Due to this difference, studies of participant "completion" may be less significant than other markers of participation within a course. We chose instead to focus our investigation of the course's effectiveness on whether and how learners engaged in different platforms, rather than on whether they completed specific components of the content.

PARTICIPATORY ENGAGEMENT

The early connectivist MOOCs tended to be quite distributed in their platform structure, utilizing blog sites, Twitter, and participant blog aggregators as core means of making facilitator and participant contributions visible and available to all (Author, 2010). However, since the advent of xMOOC platforms such as Coursera, EdX and Udacity, efforts have been made by some institutions to design participatory elements and connectivist approaches within MOOCs run on xMOOC platforms (Macleod, Woodgate, Haywood, & Alkhatnai, 2014). Some MOOC providers focused on engagement over content have entirely de-emphasized the M(assive) in MOOC (sometimes favoring the term "open course" over the term "MOOC") in order to focus on participatory pedagogical and community-building approaches (Daniels & Gold, 2014). Still others have worked towards the development of proprietary platforms (Ahn, Butler, Alam, & Webster, 2013), or have centered participatory courses around public platforms like Facebook (Stewart, 2016), wherein the notifications feature can serve to encourage ongoing engagement with course discussions. Some participatory MOOCs have aimed to draw in participants from beyond the default imaginary of the able-bodied western, white male online learners that McMillan-Cottom (2015) frames as "roaming autodidacts," around whom much MOOC literature centers. But as Daniels and Gold (2014) make clear, participatory engagement incurs significant costs in time, financial resources, and trust-building, involving the labors of designers, facilitators, institutions, and participants.

USE OF SOCIAL MEDIA PLATFORMS FOR ENGAGEMENT

Previous research has shown that social media platforms can enhance participatory learning in MOOCs. In the #InQ13 MOOC run by CUNY, an online experience specifically designed around participatory learning (Daniels & Gold, 2014), several students reflected that Twitter played a transformative role in their development. Salman et al. (2015) found that some MOOC participants' learning benefitted from informal interactions with peers. These studies have also pointed to the fact that the number of participants choosing to interact on social media platforms is often a small subset of overall participants in any given MOOC.

This trend of high participation among a small subset of social media users amid the general population of a MOOC is further emphasized by Veletsianos's 2017 large scale study conducted on the use of social media in MOOCs. In looking at the data from 116 courses that had associated hashtags on Twitter, Veletsianos found that a vast majority of participants who did tweet during MOOCs did so very infrequently, finding further that the number of tweets greatly decreased as courses progressed. Previous research suggests that incorporating Twitter or a hashtag as part of a MOOC may not encourage increased engagement; nevertheless, it is important to question how much active facilitators can influence this dynamic (Koutropoulos et al., 2014). While Veletsianos (2017) emphasizes that the existence of a hashtag does not necessarily translate into thriving interactions, he does suggest that more research is needed around the intentional use of social media platforms in MOOC pedagogical design.

UNDERSTANDING PARTICIPATION

Participation, though varied in its manifestation across learner type and medium, is unequivocally essential to learning (Meyers and Thomas, 1993). In traditional classrooms, participation allows professors to conduct informal assessments of students' mastery over course materials. In adult learning and self-directed or self-determined learning environments (Knowles, 1975; Blaschke, 2012) participation enables learners to make meaning for themselves and to learn from fellow participants in the experience, as well as from the teacher and the official course content. Participating across diverse mediums challenges individuals to consider theory in applied contexts and fosters insightful connections that further individual learning experiences (Rocca, 2010; Wade, 1994). These interactions and manifestations of engagement have been shown to result in a higher degree of content comprehension (Rocca, 2010) in situations where mastery is a valued course outcome.

Notably, basic digital literacy skills are often a prerequisite for mediating the digital technologies necessary to meaningfully participate in a MOOC (Belshaw, 2012; Stewart, 2013). There is some evidence that beyond these effects, for online learners in digital environments, the opportunity to participate without the pressure of the time-constrained classroom may "democratize" participation (Harrison & Stephen, 1996). Participation, however, may be varied in form and content, while remaining effective (Fassinger, 1996). Cohen (1991) and Fassinger (1996) both assert that participation can be short or lengthy, and may include students' questions. Early studies in computer conferencing noted that many-to-many communication was a key form of interaction in online spaces (Harasim, 1990). By enabling asynchronous interactions and utilizing written formats in which multiple contributors can be distinguished, digital platforms can make many-to-many communications more coherent than they tend to be in traditional face-to-face classroom settings. To the extent that students are interested and listening to others' comments and suggestions, discussion may be a successful means of engendering participation among learners (Wade, 1994) cMOOC participation has from the earliest models gone beyond traditional threaded discussion responses to include multiple forms of decentralized and networked participation (Stewart, 2013; Saadatmand, M. & Kumpulainen, K, 2014).

Contemporary online learning and MOOC scholarship notes several key facets of participation in digital settings (Sieman, 2005; Montgomery, 2016). One arguably core element of cMOOC participation (Caulfield, 2013) that our study was not able to fully consider was relationship-building, since there was no longitudinal element to the study. Within the limitations of our course and our data collection methods, we have operationalized participation in #engageMOOC into four categories:

> **Knowledge reproduction.** The literature notes that, though less dominant because of the popularity of decentralized MOOCs, the type of knowledge reproduction typically measured in a traditional classroom also populates online spaces (Downes, 2008). Learners' knowledge reproduction capacity could be measured through direct prompting, such as is the case when a university professor quizzes her students on their assigned reading from a previous class, or through more subtle methods such as Socratic discussions about curated content. Regardless of their method of measurement, these types of interactions hold in common an emphasis on acquiring and duplicating information that has been pre-packaged by credentialed educators (Weller, 2007).
>
> **Autonomous learning**. In direct contrast learners who absorb pre-packaged content, MOOC participants are characterized uniquely by a willingness to seek out the information they desire (Kop, 2011). Bouchard (2009) argues that in some ways, this self-direction is built into the foundation of the MOOC model for adult learning. However, other dimensions of learner autonomy emerge, such as a learners' decisions to seek targeted answers from facilitators or even from other course participants.
>
> **Information networking**. A further indication of meaningful participation involves acting upon the intention to network external content to that within the course, This social knowledge construction represents the model of education in which experts and students share knowledge with one another, rather than choosing to perform the roles of the established educational hierarchy (Downes, 2012).
>
> **Scholarly engagement**. Finally, a common intention of open, iterative, collaborative MOOC environments is to encourage participants to frame themselves as scholars and contributors, rather than as passive recipients of knowledge (McAuley, Stewart, Siemens, & Cormier, 2010). This type of participation could be captured through the evaluation of pedagogical structure, the promotion of course material to external audiences, or

other demonstrations of facilitator level investment in the outcomes of the course.

RESEARCH QUESTION

Addressing a demonstrated gap in the existing scholarly knowledge (Veletsianos, 2017), and seeking to optimize user learning in MOOCs generally, we ask: How do learner interactions differ depending on the platform used for engagement?

THE CASE

"Engagement in a Time of Polarization," or #EngageMOOC, was a two-week long, open, facilitated conversation on media literacy and the use of participatory models for addressing the contemporary information ecosystem (Davidson College, 2018). The course officially ran from February 12th, 2018 - February 26th, 2018, though material remained available after that period as an archived course on the EdX platform. #EngageMOOC was part of a series called Davidson Now, a collection of short and timely MOOCs offered by Davidson College, a small liberal arts college in North Carolina (Davidson College, 2016). Jointly facilitated by two scholars – one then affiliated with Davidson College and one then affiliated with the University of Prince Edward Island – #EngageMOOC specifically attempted to offer a distributed, participatory, cMOOC-style course using EdX, Davidson Now's standard core MOOC platform. Both facilitators had significant social media presence – one among online educators and instructional design practitioners, and the other in academic sociology. The facilitators' social media presence may have influenced those choosing to sign up and participate in the course. In addition to facilitators, guest "provocateurs" contributed formal written pieces to the course content and participated in one live stream conversation. These provocateurs were invited to blur the lines between who constitutes a learner and who an expert.

As a platform, EdX was primarily designed for xMOOC-style content delivery, rather than to support cMOOC activity (Crosslin & Dellinger, Lessons Learned while Designing and Implementing a Multiple Pathways xMOOC+ cMOOC , 2015; Kim, 2016). Built by MIT and Harvard as a flagship platform at the pinnacle of MOOC excitement, EdX is a centralized, log-in only platform with limited conversational threading capacity (Breslow, et al., 2013). But like CCK08, which tried to explore and model connectivism (Mackness, Mak, & Williams, 2010), #EngageMOOC was intended both to embody and to study the participatory ethos at its centre. Thus, the course facilitators and team chose to encourage the open use of the #engageMOOC Twitter hashtag throughout the MOOC duration and during specific, scheduled Twitter chats conductd in response to facilitators posing clear question prompts. In addition to Twitter, the team scaffolded discussion forums and a live chat within EdX to try to foster emergent knowledge creation and learner connections. Finally, the course team hosted regular, live Google hangouts during the two weeks the course ran, while encouraging users to respond to the stream on Twitter and YouTube, thus creating cross-platform opportunities for engagement with course ideas and with fellow learners.

GENERATING DATA FROM #ENGAGEMOOC

#EngageMOOC had just under 1000 participants and was designed to give participants choices regarding where and in what manner they took part, was all of which operated in keeping with the participatory engagement focus of the MOOC. The intention in distributing the course platforms was to encourage meaningful participation by offering variety, rather than limiting learners to a single platform designed specifically for content delivery. The design choice also was made in an attempt to decenter teacher authority and to encourage the pedagogical emergence of networked knowledge among participants. While Twitter has its own hierarchies of participation and influence, the use of Twitter has been shown to destabilize traditional academic hierarchies (Stewart, 2015). Using Twitter for course events such as live chats also enabled the inclusion of new encounters and types of participation throughout the course duration, since Twitter-mediated events took place in the open.

Notably, some course participants who contributed to the Twitter hashtag did not officially register for the EdX version of the course. While we considered anyone who engaged with another person around the course material to be a participant in the course, this study includes only data from those participants who registered in the EdX platform in data analysis, as these were the only participants for whom we gathered demographic information.

We analyze learner participation for sampled users on EdX and Twitter, conducting a content analysis of learner comments made within course discussion boards in EdX and comments generated using the #EngageMOOC hashtag on Twitter. We used a random number generator to sample 154 of the 328 active MOOC participants, marking each user as a 0 (not included) or a 1 (included), which resulted in a random sample of 46.9%. We define as “active MOOC participants” the 328 individuals among over 900 users who registered for the EdX course and who participated on either EdX or Twitter by contributing at least a single discussion post, comment, or tweet. We include the 1276 comments made by the randomly selected sample of 154 “active” participants, a subset of the 2759 comments made in total by all 328 “active” participants. The unit of analysis for this research is the interaction – data regarding learners is attached to individual comments shared on either of the two platforms.

INDEPENDENT VARIABLE

Platform. The variable of interest in this research is learning platform. Crucial to understanding the role of platform in shaping learning participation and interaction is the use of data detailing where interactions are taking place. To this end, we include these data as an independent variable in the analysis. Of the sampled interactions, 72.7% – 928 total – were shared on Twitter, while the remaining 27.3% – 348 discussion posts – were scraped from EdX.

CONTROL VARIABLES

The extant literature establishes the importance of learner positionality in predicting types and styles of learning and engagement in MOOCs (Guo & Reinecke, 2014). Here, demographic variables proxying learner positionality are described and justified.

Gender. Gender matters in the ways in which learners interact in online courses (Blum, 2005; Rovai & Baker, 2005; Bostock & Lizhi, 2005). Existing literature suggests women participate less in gender-mixed groups (Bostock & Lizhi, 2005). Identifying as a man also has been associated with fewer interactions explicitly affirming other students' posts, and more interactions that express the poster's own expertise and authority (Guiller & Durndell, 2006). This male dominance in learning spaces has the potential to hamper women's learning severely in online classes (Blum, 2005).

MOOC participants shared their gender identities while registering their user accounts on EdX – choosing between man, woman and other. A total of 61% of users shared their gender identities, leaving 39% of users with missing age values. Of those sharing gender identities, 58% identified as female, 40% as male, and 2% as other.

Age. Few substantive differences in online learning associated with age are established in the extant literature (Wang, Wu, & Wang, 2009; Muilenburg & Berge, 2005; Richardson & Swan, 2003). With increased age may come decreased barriers to participation, controlling for other demographic variables (Muilenburg & Berge, 2005). Decreased barriers, however, do not necessarily lead to increased participation.

MOOC participants shared their years of birth while registering their user accounts on EdX. Using the end of 2018, the year in which the MOOC went live, as the present, we calculated the ages of learners at their time of participation. Just over 59% of users reported years of birth, while 41% did not. The average learner age of those responding to this question was 42, with a standard deviation of 14.7 years.

Educational Attainment. The educational background of learners has been posited to contribute to learners' online learning outcomes (Breslow, et al., 2013; Nawrot & Doucet, 2014). Given this, we control for learners' educational histories in modelling their participation. Building on decisions made by the US

Census Bureau regarding the reporting of educational attainment (Bauman & Graf, 2003), we exclusively classify the educational attainment of individuals who are at least 25 years old. We follow the that for those under 25, educational attainment is still in development. Educational attainment information for all MOOC participants was recorded for 62% of users; with 15% having obtained a PhD, 42% having earned a Master's, 24% a Bachelor's, and 6% reporting high school or some college completed. Just over 13% were users who were under 25, who therefore were considered still on their educational trajectories.

DEPENDENT VARIABLES

For each of the 154 randomly selected "active" participants selected for this study, the authors coded all sampled comments and interactions for a variety of themes, all of which measure elements of participatory learning, using content analysis procedures (Neuendorf, 2016). Here, individual codes are described, as well as the concept groups into which the codes fall. All sampled interactions were subjected to this coding procedure.

Autonomous learning. The *autonomous learning* construct indicates that a particular interaction includes one or more of a *follow up question, crowd sourcing,* or *facilitator/provocateur engagement*. Of all interactions, 50.1% included indications of *autonomous learning*.

> ***Follow-up question***. This code marks posts and tweets that include a question directed to a person or group of people. Inclusions such as "What do you think, Jane?" and "John, do you agree?" were coded with a "1" in this variable. Of the sampled interactions, 19% included at least one *follow up question*.
>
> ***Crowd sourcing***. Interactions that engage with not a single learner or facilitator, but rather work to build networks of information throughout the larger community are tagged in this category. Questions or requests directed at any reader – for example "Does anyone have any thoughts?" – were coded "1." Of all the sampled interactions, 5.7% were coded as containing *crowd sourcing*.
>
> ***Facilitator/provocateur engagement***. This code marks interactions that explicitly engaged with a course facilitator or provocateur. Approximately 36% of interactions do so, including language that is typified by "@[facilitator], the other day…" Levels of formality and detail varied considerably.

Knowledge reproduction. Interactions that made *internal references*, or referenced material from within the course, evince the use of course knowledge. Interactions that referenced course facilitator-provided content – whether on EdX or Twitter – were coded '1' for *knowledge reproduction*. Of all interations, 21.2% showed *knowledge reproduction*.

Internal references. This variable referenced materials or sources provided by course facilitators, either on the course EdX platform itself or less directly. "Mike Caulfield's 4 Moves affected the way I think about..." was an example of a reference to course material, while "'Polarization isn't really that bad sometimes' – [facilitator] in #engageMOOC" was an example of more indirect reference to course facilitator-provided content. Both were coded "1" for internal reference. Of the sampled interactions, 16.5% included *internal reference*.

Internal references across platforms. Interactions that presented *internal references across platforms* were those that included references to course material held on a platform different than the one in which the engagement was taking place. Just under 10% of interactions were coded with a "1" for this type of reference, typified with statements such as "Like Natalie said earlier in the hangout …"

Information networking. Information networking variable coding refers to interactions that employed *external references* and those that employed *external hashtags* – that is, hashtags on twitter that were not #EngageMOOC. Just over 45% of interactions were coded as Information Networking.

External references. This characterizes interactions that referenced materials or sources outside of the course material and not provided by course facilitators. Statements such as "Read this article by Gaventa" or "Check out this New York Times article" were typical, and coded "1." Posts that included mentions and external links were all flagged using this code. Just over 35% of interactions included reference to material outside of the course.

External hashtags. This code flagged interactions that used hashtags other than the communal #EngageMOOC in an attempt to broaden the relevance of the message. Typical of this genre is "Love this course. #BergNIT18 #engageMOOC". Of all interactions, 20.6% were coded as having external hashtags. Of Twitter interactions, 28% were coded positively, reflecting the hashtag's more popular use on this platform.

Scholarly engagement. Interactions exhibiting either *course promotion*, the *sharing of digital literacy tips and tricks*, or *structural or pedagogical engagement* were coded as exhibiting scholarly engagement. Of learner interactions, 25.5% were marked as characterizing *scholarly engagement*.

Course promotion/invitations. Insofar as an interaction attempted to build interest or enthusiasm for the course or course elements or events, promoted joining the course, or otherwise invited non-members into the formal learning community, the interaction was flagged as a "1." Encouragements to "[t]une into the live chat tonight!" were typical here.

There were 127 interactions coded as representing instances of this type of promotion, comprising 10% of the total sample.

Sharing digital literacy tips and tricks. The *sharing of digital tips and tricks* marked those interactions that made suggestions regarding how to navigate the existing media landscape. "This Google Plugin helps me manage my data privacy…" is an exemplar of interactions coded "1" for this measure. Of all sampled interactions, 9.5% of interactions shared tips and tricks.

Structural or Pedagogical Engagement. Comments expressing engagement with the structure or the pedagogy of the course were coded for this attribute. Typical responses were often structured "I do[n't] like the way these activities are structured." Approximately 14% of all sampled interactions were coded a "1" on this measure.

ANALYSIS AND FINDINGS

Using the independent variable, demographic control variables, and constructed dependent variable measures, we present findings from bivariate and multivariate analyses. Final models are binary logistic regressions that estimate the likelihood of an interaction exhibiting particular measures of learner participation on the platforms of interest given gender, age and educational status positions. Because full models control for learner positionality, only those interactions made by users registered on the EdX platform are included in full models.

BIVARIATE ANALYSES

Table 1 presents the means of learner participation measures for each of the independent variables of interest. We present statistical significance markers from F-test results to indicate reliable differences in group means. Because of the dichotomous nature of the dependent variables, means also indicate proportion of affirmative cases. So, for example, the group mean measure for *autonomous learning* on Twitter is 0.5486 – meaning that 54.86% of interactions were coded '1,' with the remainder coded '0' – so 54.86% of Twitter interactions exhibit *autonomous learning*. Similarly, 20.45% of posts written by participants between the ages of 21 and 30 exhibit *networked information*.

Platform. Findings indicate that, depending on the platform of engagement, learner engagement differs dramatically in many ways. Simply, choice of platform is correlated to all measures of user participatory learning, with interactions on Twitter being far more likely to exhibit measures of learner participation.

Gender. In bivariate analyses, gender identity has limited significance in its relationship with learner participatory engagement. Although participants of different gender identities participated in marginally different ways, these differences did not exhibit at statistically significant rates.

Age. Bivariate analysis suggests that age category correlates with many participant learning outcomes. With the exception of *knowledge reproduction*, age does predict the presence of these measures in these bivariate analyses, which do not have any controls for user platform or positionality.

Education. The educational level of the user correlates with all measures of learner participatory engagement. The amount of educational credentialing with which a participant enters the course predicts very different types of comments and posts in terms of exhibited active learning.

Table 1: Comparisons in Group Means and *f*-Test Results and Markers

Independent Variable	Autonomous Learning	Knowledge Reproduction	Networked Information	Scholarly Engagement
Platform	***f*=30.663*****	***f*=6.571****	***f*=242.198*****	***f*=11.852*****
Twitter	0.5486	0.2314	0.5793	0.2808
EdX	0.3764	0.1652	0.1322	0.1868
Gender	***f*=3.313†**	***f*=1.460**	***f* =1.797**	***f* =1.942**
Female	0.5287	0.2490	0.2992	0.2746
Male	0.6041	0.2065	0.2493	0.3284
Age	***f*=3.537****	***f*=1.313**	***f*=2.063†**	***f*=9.978*****
<20	0.4286	0.2857	0.4643	0.2957
21-30	0.7727	0.2955	0.2045	0.6364
31-40	0.6000	0.1538	0.2769	0.5077
41-50	0.5802	0.2519	0.2863	0.2901
51-60	0.5413	0.1905	0.2844	0.1927
61-70	0.3810	0.1429	0.1667	0.0714
71-80	0.2222	0.1111	0.0000	0.1111
Education	***f*=9.930*****	***f*=1.439**	***f*=25.742*****	***f*=10.659*****
High School	0.6786	0.1429	0.1429	0.1071
Associates	0.3810	0.1500	0.1905	0.1905
Baccalaureate	0.3285	0.1643	0.5845	0.1111
Masters	0.5527	0.2161	0.2843	0.2812
PhD	0.7042	0.2143	0.2676	0.4789

†= p<0.10; * = p<0.05; ** = p<0.01; *** = p<0.001

FULL MODELS OF PARTICIPATORY ENGAGEMENT

In order to better understand the relationship between posts and comments exhibiting learner participatory engagement, platform, and learner positionality, we employ binary logistic regression modelling. Table 2 details the results of these logistic models. Presented are exponentiated ß values, with significance markers.

Table 2: Logistical Regression Models on Participatory Engagement

Independent Variable	Autonomous Learning	Knowledge Reproduction	Networked Information	Scholarly Engagement
Twitter	3.608***	1.740**	2.723***	3.205***
Female	0.830	0.866	1.478	0.422**
Age	1.010	1.077	0.940	0.903
HS or Associates	0.700	0.105**	0.333	0.023***
Baccalaureate	0.194**	0.629	1.024	0.129***
Masters	0.331*	0.394	1.304	0.117***
PhD	0.862	0.407	1.226	0.297*

†= p<0.10; * = p<0.05; ** = p<0.01; *** = p<0.001

Platform. Controlling for demographic variables that proxy learner positionality, the platform of engagement significantly predicts the likelihood that a particular interaction will exhibit all types of learner engagement. Posts made on Twitter were 360% as likely as – or 260% more likely than[1] – those on EdX to contain measures of autonomous learning. Similarly, posts on Twitter were 74% more likely to employ *knowledge reproduction*, 172% more likely to *network information* and 220% more

[1] Odds likelihood ratio figures represent the relative likelihood of a dependent variable occurring given a one-unit increase in the independent/control variable. A ß of 1.000, for example, indicates that, with a one-unit increase in the independent variable, the dependent variable is 100% as likely to occur as in the absence of the one-unit increase. Another way of saying this is that is represents a 0% change in the likelihood of the dependent variable. Similarly, a ß of 1.800 indicates that, with a one-unit increase in the independent variable, the dependent variable is 180% as likely to occur as in the absence of the one-unit increase. Another way of saying this is that a ß of 1.800 represents an 80% increase in the likelihood of the dependent variable – a positive correlation. Conversely, a ß of 0.800 indicates that, with a one-unit increase in the independent variable, the dependent variable is only 80% as likely to occur as in the absence of the one-unit increase. Another way of saying this is that a ß of 0.800 represents an 20% decrease in the likelihood of the dependent variable – a negative correlation.

likely to exhibit *scholarly engagement*. Findings suggest that Twitter posts are more engaged posts, with all of the learning improvement that engagement level implies.

Gender. Full models suggest that, controlling for other factors, the instance of a post being written by a learner identifying as a woman does not predict the likelihood that interaction exemplifies *autonomous learning, knowledge reproduction,* or *networked information*. Women's posts are, however, only 42% as likely as those of non-women to engage as an expert scholar with ownership of the course.

Age. Controlling for other factors, age of the user is not significantly related to the learning engagement in posts.

Educational Status. The achievement of some educational statuses represents a relationship of different magnitude and significance level with different measures of learner engagement. Using participants under the age of 25 as the reference category, users with a BA are 81% less likely and those with a Masters 67% less likely to have posts that employ *autonomous learning*; those who have not at least completed BAs are 90% less likely to have *knowledge reproduction*, and all education levels are less likely to exhibit *scholarly engagement* than than those who are presumed to still be students as a function of their age.

DISCUSSION AND CONCLUSION

We endeavored to learn how open to participation and engagement an ostensibly open course could be when conducted within a platform we deemed to be a relatively closed learning environment. Exploring the interactions contributed by learners in the "Engagement in a Time of Polarization" MOOC, we analyzed differences in participation across platforms of engagement. Findings were provocative. Despite significant investment in closed MOOC platforms like EdX, this research suggests that, in the case of this short course, at least, open communities of participants operating in public spaces outside the closed platform achieve more effective participatory learning. This finding we base upon our analysis of important demographic variables that the extant literature posits to be relevant in predicting engagement.

On Twitter, "Engagement in a Time of Polarization" MOOC participants appeared to take primary responsibility for their own learning. They asked and answered questions about class subject matter and about issues of their own interest. They engaged with one another and the larger community. Some of these engagements could be framed as representing chosen performances in the public sphere, or vying for attention from perceived peers (Rui & Whinston, 2012) They could also be framed in terms of leadership, and making meaningful choral contributions to the learning of others. These types of engagement were far more rare on EdX. Many of the #engageMOOC EdX contributions tended to take on the tone of a class assignment – directed towards no one explicitly and unnamed teacher-figures implicitly. The formal structures and discussion forum conventions of EdX may have represented a locus of surveillance in the course, potentially limiting participation and engagement (Somekh, 2007); we are unsure of the motivations behind the difference. But the tones of the two platforms were quite distinct.

EdX posts created by participants of the "Engagement in a Time of Polarization" MOOC exhibited a relatively low level of the constructed *knowledge reproduction* measure. Comparatively speaking, comments and interactions on the EdX platform also lacked the applied use of course terms and concepts. Conversely, Twitter posts seemed to reflect users' eagerness to share newly acquired knowledge with a large potential audience. In the area of *knowledge reproduction*, this distinction between platforms is significant. The interactions of users with only High School or Associates degree educations are important to discuss here. Irrespective of platform, these users were nearly 90% less likely to demonstrate *knowledge reproduction* – suggesting that users with less prior educational attainment feel less comfortable with course knowledge than their counterparts with more formal institutional preparation. Insofar as course material can include more background information – and take fewer elements of general education for granted – this may create a MOOC that is more accessible to those with limited educational credentials.

While the disproportionate prevalence of interactions indicative of *networked information* on Twitter is notable – it may also be an indication of the intended differences in structure between EdX and Twitter. Twitter facilitates the incorporation of hashtags and links as a feature of the platform, and facilitates the amplification of hashtags and links through the retweet function. Although one can accomplish similar effects in EdX, these effects are not crucial or fundamental to the platform design. The disproportionality of *networked information* may be reflective of this.

The incidence of learners employing *scholarly engagement* in their interactions was notably greater on Twitter than on EdX. Twitter posts reflect users' beliefs in their own expertise. They reflect learners' beliefs and judgements about everything from the course material to course and content structure themselves. Although correlation is clear in this relationship, the causal direction is not – perhaps more confident learners express themselves more on Twitter, rather than Twitter's platform being de facto more empowering. Other significant correlations with posts displaying *scholarly engagement* include gender identity and educational attainment – users identifying as women wrote posts that were 58% less likely to display *scholarly engagement*, controlling for platform and educational attainment. In keeping with the existing literature on gender in spaces of learning, women in #EngageMOOC did not present themselves as authorities in the learning space. Similarly, users who had completed any level of education were significantly less likely than those still in a student role to author posts that were coded positively for *scholarly engagemen*t. While this finding was not specifically expected given the extant literature, it may be suggestive of the prevalence of more agency in current systems of formal education.

Although findings are thus nuanced by correlations between participatory engagement, gender and educational background, the platform of engagement significantly predicts participatory interaction content for students across age, gender and educational backgrounds. Users interacting on Twitter asked and answered more questions, utilized more of the course knowledge, networked course information to external sources, and engaged more often as experts and agents in their learning than they did when interacting on EdX. Building on Veletsianos (2017) and on various work in the scholarship of learning to construct measures of student learning (Bouchard 2009; Downes, 2012; McAuley, et al., 2010; Siemens 2012; Weller 2007), we find that participants in the "Engagement in a Time of Polarization" MOOC exhibited evidence of greater participatory engagement in the public platform than in the closed platform made available for interactions.

The ramifications of this for MOOC design are far-reaching and important. Although EdX and other MOOC platforms that are available to closed communities of learners have advantages, we believe their exclusive use is not optimal for engendering participatory engagement or the meaning-making and self-directed learning that can result from participation in many-to-many learning environments. Rather, we found that open social media platforms – for all their issues – supported far stronger indicators of participatory learning amongst participants, at least during our short MOOC.

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