

Understanding Student Motivation, Behaviors, and Perceptions in MOOCs

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ABSTRACT

Massive Open Online Courses (MOOCs) have recently experienced rapid development and garnered significant attention from various populations. Despite the wide recognition of MOOCs as an important opportunity within educational practices, there are still many questions as to how we might satisfy students' needs, as evidenced by very high dropout rates. Researchers lack a solid understanding of what student needs are being addressed by MOOCs, and how well MOOCs now address (or fail to address) these needs. To help in building such an understanding, we conducted in-depth interviews probing student motivations, learning perceptions and experiences towards MOOCs, paying special attention to the MOOC affordances and experiences that might lead to high drop rates. Our study identified learning motivations, learning patterns, and a number of factors that appear to influence student retention. We proposed that the issue of retention should be addressed from two perspectives: retention as a problem but also retention as an opportunity.

Author Keywords

Massive Open Online Courses; MOOCs; online learning; student retention; learning motivation; learning experiences

ACM Classification Keywords

H.5 [Information Interfaces and Presentation] (e.g. HCI); K.3.1 [Computer Uses in Education]: Distance Learning; J.4 [Social and Behavioral Sciences]

General Terms

Human Factors; Design

INTRODUCTION

Massive Open Online Courses (MOOCs) are a recent expansion in e-learning and distant education that have experienced rapid development and achieved substantial attention from a broad range of learners. Compared to traditional online courses, MOOCs are larger in scale and

distributed worldwide across a variety of networks and platforms, with no limitations on individual involvement. MOOCs provide an opportunity to teach interesting or critical content to new groups of learners [18]; they also may have important impacts for online education practices in general, for instance allowing institutions to develop distinctive MOOC-centered missions [8]. As Siemens noted "even if the current generation of MOOCs spectacularly crash and fade into oblivion, the legacy of top tier university research and growing public awareness of online learning will be dramatic." [32]

Although MOOCs have been widely accepted, and are rightly viewed as an educational innovation, education researchers know very little about what student needs a MOOC may address, or how well they address those needs. In comparison to the more long-lived concept of a virtual learning environment (VLE), MOOCs are a relatively new phenomenon. They differ from VLEs from several ways including scale, students' level of control and flexibility, the relative roles of instructor and students, student motivation and outcomes. Although efforts have been made to understand user experiences (UX) of VLEs [21, 26, 35, 41], differences such as these can cause a misalignment of UX observations for VLEs situations. Thus, educators have called for a study of user experiences in the context of MOOCs [25, 12]. Milligan emphasized, "understanding the nature of learners and their engagement is critical to the success of any online education provision, especially those MOOCs where there is an expectation that the learners should self-motivate and self-direct their learning [25]."

Notably, MOOCs have been plagued by extremely high drop-out rates [1, 4, 9, 17, 19]. Although several studies have investigated students' retention and engagement issues, surprisingly little research attention has been directed to the population of students who do not finish the courses in which they register [1, 25]; as a result it is difficult to fully capture the user experiences tied to retention problems, and many important reflections are missed [30]. In recent years, some researchers have been using data mining method to investigate enrollment and retention within large datasets [13, 20, 16]. Nevertheless, even these researchers have called for qualitative studies that can complement and help to the quantitative trends and patterns mined from the online data [16]. It is essential to understand student motivations, learning perceptions and experiences towards MOOCs, and to understand how the

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affordances and experiences of MOOCs may lead to high drop rates.

Historically, MOOC designs have been of two different types: the connectivist MOOCs (cMOOC) applying the concepts of connectivist learning (e.g., an emphasis on connected, collaborative learning)[8, 31, 32]; and content-based extended MOOCs (xMOOCs), which emphasize a more traditional learning approach by video presentations that are complemented by short quizzes and other testing[8, 31, 32, 39]. Here we focus particularly on the more recent xMOOCs, as this is the style of MOOC that has grown so tremendously in scale and variety, gaining significant attention by students and institution, but without a solid understanding of the student experience and factors influencing retention and outcomes.

In this paper, we employ the grounded theory method in an in-depth interview study to investigate users' motivation to register for a particular course, their learning perceptions and behavior patterns, and potential reasons for not finishing courses. Using these interview data, we have identified four broad types of motivations for joining a MOOC, which we have labeled fulfilling current needs, prepare for the future, satisfying curiosity, and connecting with people. Also, five interesting learning behavior patterns emerged from our interviews, including the auditing of a MOOC, or joining MOOCs as part of a pre-existing cohort. We also recognized multiple factors as threats or opportunities affecting retention during online learning. Those interesting stories suggest that researchers should consider MOOCs as a new virtual organization that integrates educational content, technology and learners. We discuss design implications from these results as well. In general, our study provides actionable guidance for MOOCs and also fills the gap of current literature on retention problems. Our efforts will help improve MOOCs overall community and offer better opportunity for students to enjoy learning and occupy MOOCs.

LITERATURE REVIEW

MOOCs are a manifestation of the open education movement that emphasizes how open education resources and tools can improve the quality of education [14]. Open education platforms (i.e., Coursera, edX, Udacity, etc.) utilize technological innovations (e.g., interactive videos) to allow educators to provide MOOCs to massive number of students [11]. Meanwhile, this educational format allows students to overcome physical and financial barriers [33] and to freely pursue their own learning goals [2]. Not surprisingly, these opportunities have attracted significant attention from education and technology researchers and practitioners.

MOOCs may impact society in multiple ways. First, they may expand or enhance teaching practices, encouraging institutions to develop distinctive missions [8] and to provide an opportunity to develop new pedagogy. For instance, MOOCs can provide their students with better and

more varied teaching than individual instructors might be able to develop by themselves [8]. Second, they may increase access to good teaching and interesting curriculum for new groups of learners, and help attract students into higher education who might otherwise not have ventured there [18]. The current focus on MOOCs is opportunity for researchers to engage with emerging pedagogical mode that is significantly under-theorized [18].

MOOCs and VLEs

We draw some research inspirations from existing online learning literature. Virtual Learning Environments (VLEs) have evolved from commercial course management systems (e.g., Blackboard) to current open source platforms (e.g., Moodle)[39, 21]. They have been widely adopted by higher education institutions (HEIs). In terms of technical features, VLEs and MOOCs platforms offer similar course content delivery and forum-based discussion features. However, in terms of pedagogical differences, MOOCs are designed and implemented very differently because of their *massiveness* and *openness*. Below we detail how MOOCs separate themselves from VLEs based on these characteristics.

First, the intention of MOOCs is to make course content available to as many people as possible. The number of students in MOOCs typically ranges from tens of thousands to hundreds of thousands. The scale of a VLE is typically much closer to that of traditional classrooms and is much smaller than MOOCs. MOOCs need to be designed differently to accommodate the large number of learners. Specifically, while the instructors are expected to play a hands-on role and to provide personal feedback in VLEs, the learners in MOOCs take a much greater role in shaping their own learning experiences [39]. For instance, in a MOOC, an instructor acts more as a facilitator [5, 23, 39] fostering a space for learning connections to occur. MOOCs instructors also often rely on automatic assessment and peer grading instead of providing personal feedback like the VLE instructors [18].

Second, a fundamental mission of MOOCs is to make the course materials *freely* and *openly accessible* to the general public, whereas VLEs are adopted by HEIs based on the traditional university course scheduling, format and registrations [21, 26]. For this reason, most MOOCs only offer a completion certificate, whereas students using VLEs are often earning credits for a formal degree. In this sense, participants in VLEs are a "captive audience" [21] wherein learners cannot choose a preferred VLE, but rather must use the online learning content and tools mandated by their institution. MOOC users have the freedom to adopt different learning platforms and content depending on their needs. The open nature of MOOCs creates a population that is self-selected to be engaged and passionate about this approach to learning [40].

Although research on VLE usability and UX [21, 26, 35, 41] can provide some insight for MOOCs, the pedagogical and sociotechnical differences in terms of MOOCs'

massiveness and *openness* are likely to lead to distinctive considerations for the design of both systems and curricula. Therefore, it is necessary to fully investigate user experiences in MOOCs.

Recently, VLE providers have considered how they might expand services and features to accommodate MOOCs, facilitating more open access to VLE courses, as well as supporting advanced analytics, interactive multimedia, synchronous collaboration, and even integration with student support services [40]. Thus, the MOOC characteristics of size and open access may be integrated within existing VLEs [40]. If so, an understanding of UX for MOOCs may provide valuable input to these extended VLEs.

cMOOCs versus xMOOCs

The development of MOOCs is rooted within the ideals of openness in education, namely that knowledge should be shared freely, and that the desire to learn should be met without demographic, economic, or geographical constraints [24]. Historically, MOOCs have developed into two distinct directions: the connectivist MOOCs (cMOOCs) and extended MOOCs (xMOOCs). According to Siemens, cMOOCs focus on knowledge creation and generation while xMOOCs focus on “knowledge duplication” [8, 32].

cMOOCs, pioneered by Siemens and Stephen Downes with a first course “Connectivism and Connected Knowledge 2008” [8, 9], seek to embed online discussions and collaborations by which the networked community of learners will build knowledge and understanding. cMOOC participants are free to share material and collaborate using any technological tools they like [24]. While xMOOCs (edX, Coursera, Udacity, etc.) and cMOOCs share the notion of free worldwide participants in a course without credit, xMOOCs differ in that they employ a well-defined course management platform.

Here we focus on the more recent xMOOCs that have emerged quickly and at a tremendous scale, gaining rapid attention from students and institutions [8]. We hope to address the paucity of research examining xMOOC retention issues [4], especially using a qualitative methods. All subsequent mentions of ‘MOOCs’ in this paper refer to the xMOOCs.

Current Research on MOOCs

A large (massive) group of learners is an indispensable part of any given MOOCs’ success [8, 40]. However, the learning experiences of these massive groups have been difficult to characterize. Milligan noted that “understanding the nature of learners and their engagement is critical to the success of any online education provision, especially those MOOCs where there is an expectation that the learners should self-motivate and self-direct their learning [25].” Haywood also pointed out that much more research is needed to understand MOOC learners, for instance how to design and deliver content successfully across a range of

subjects and at a range of levels, ensuring that the MOOC experience is helpful to learners, and that learners get value from their certificates of completion [12].

A number of researchers have investigated issues that might improve the experience and success of MOOC courses. One stream of literature has examined on the role of discussion forums and how users utilize these during learning in MOOCs [6, 13, 20]. Other researchers have investigated the challenges of peer assessment [15, 27, 33]. Still others have worked at a more general level to characterize MOOCs and to call for improving the learner experience [5, 22].

One notable phenomenon in MOOC research is the very low retention rates in MOOCs [1, 4, 8, 9, 19, 16]. Researchers have attempted to investigate the observed retention and engagement issues and offered design insights that might better serve learners’ needs [1, 16, 25]. For instance, Milligan et al. explored patterns of engagement in cMOOCs and uncovered three general patterns: active participant, lurker, and passive participant. They also found factors affecting engagement, including confidence, prior experience and motivation [25]. Adamopoulos identified teachers as the most important factor affecting retention. However, these studies have not yet attended to the population of students who drop out of MOOCs [1, 25]. As a result, the results of these earlier studies may be biased because they do not capture the experiences of users who engage little or not at all with the course [30].

Another set of researchers have been applying learning analytics to investigate retention issues [4, 13, 16, 20]. Clow proposed a model named “the funnel of participation” to describe MOOCs retention, in which learners would go through a four-stage funnel (i.e., awareness, registration, activity, and progress)[4]. Only some of them will achieve meaningful learning progress at the end; drop off at each stage is large. However, this work does not explain the *causes* of the drop offs and what we might do to encourage more learners to attain meaningful learning outcomes. Kizilcec et. al made a finer analysis of MOOC disengagement, and classified learners into four categories (i.e., auditing, completing, disengaging, and sampling), but again these results do not explain the rationales that led to student disengagement[16]. They call for qualitative study to more fully explore and complement their study that relies on quantitative data analysis [16].

Our study extends these prior studies and employs the methods of grounded theory in an in-depth interview study to investigate users’ motivation to register for a particular course, their learning perceptions, behavioral patterns, and potential reasons for not finishing the MOOCs courses.

RESEARCH METHOD

Data and Data Collection

We posted a study recruitment announcement on research website of a large northeastern university. We also recruited

participants using a snowball sampling method, through our social media accounts and personal friendship network.

At the beginning of the semi-structured interview, we gathered demographic information about each participant (e.g., gender, age, occupation). We then interviewed participants about their general MOOCs experiences (e.g., how many MOOCs they have taken, what are the topics of

these MOOCs, the platforms used to access the online courses, how long they have been using MOOCs). Our particular focus was on the motivations for joining and continuing (or not) with a course.

Interviews ranged from approximately 35 minutes to 2 hours. All interviews were audio-recorded, annotated and transcribed for further data analysis. The interviews

#	Occupation	Gender	Age	Region	Interview	Citizenship	Completed Courses	Uncompleted Courses
P1	Student	M	20	U.S.	F2F	American	American History(C)	Game Theory(C)
P2	Student	F	25	China	Skype	Chinese	Social Network Analysis(C)	Networks: Friends, Money, and Bytes(C)
P3	Student	M	27	U.S.	F2F	Chinese	Machine Learning(C) American History(C) Artificial Intelligence(E) Music in the 20th Century(E) Game Theory(C) Natural Language Processing(C)	Cryptography(C) Principles of Written English(E) Academic Writing(C) Mathematical Methods for Quantitative Finance(C)
P4	Employee	M	26	U.S.	Phone	American	Cryptography 1(C)	Cryptography 2(C); Creativity, Innovation, and Change(C)
P5	Student	M	20	U.S.	F2F	Italian	Java(U)	Computer Science101(C)
P6	Student	M	23	China	Skype	Chinese	HCI(C) Social Network Analysis(C) Introduction to Databases(C) Learn to Program: The Fundamentals(C) Statistics: Making Sense of Data(C)	Game Theory(C) Introduction to Data Science(C) The Fiction of Relationship(C) Design: Creation of Artifacts in Society(C) The Camera Never Lies(C)
P7	Student	M	25	U.S.	F2F	American	HCI(C) Personal Finance(C)	Networks: Friends, Money, and Bytes(C)
P8	Student	M	18	U.S.	F2F	Indian	Python (U)	Python (C)
P9	Student	F	26	U.S.	F2F	Chinese	Machine Learning(C) Game Theory(C) Data Analysis and statistical inference(C) Networks: Friends, Money, and Bytes(C)	Statistics(C) Artificial Intelligence(E) Principles of Written English(E) The Ancient Greek Hero(E) Algorithms(U) Data Analysis(C)
P10	Student	M	24	U.S.	F2F	American	Web Development(U) How to Build a Startup(U)	Java(C)
P11	Student	F	26	U.S.	F2F	American	Maps and the Geospatial Revolution(C)	Statistics(C) Computing for Data Analysis(C)
P12	Student	F	22	China	Skype	Chinese	Algorithms(C)	Foundations of Computer Graphics(E)
P13	Engineer	F	36	U.S.	Tele	American	Introduction to Arts(C)	Renaissance Architecture in Italy(C)
P14	Manager	M	40	U.S.	Skype	American	--	Social Psychology(C) History of Chinese Architecture(E) How to Build a Startup
P15	Stay-at-home Parent	F	32	U.S.	F2F	American	Computer Science101(C) Introduction to Arts(C)	Calculus: Single Variable(C) Maps and the Geospatial Revolution(C)
P16	Parent	F	36	U.S.	F2F	Japanese	Statistics One(C) Music(C)	Algorithms, Part I(C) Introduction to Arts(C) Science & Cooking(E)
P17	Retire	M	62	U.S.	F2F	American	Guitar(C)	Songwriting(C)
P18	Ph.D	F	26	U.S.	Skype	Germany	Social Network Analysis(C)	Academic Writing(C) Core Concepts in Data Analysis(C) A History of the World since 1300(C)

Table 1. Demographics of Participants and MOOCs Usage. (C) for Coursera, (E) for edX, and (U) for Udacity.

produced a rich set of recollections and descriptions addressing many issues in the MOOC experience, which have been summarized as a number of emergent themes. The balance of this paper will focus on four categories of findings: 1) *motivations of registering for the particular course*; 2) *online learning perceptions and behaviors*; 3) *reasons for not finishing the course*; 4) *design reflections and suggestions to better fulfill their study needs*.

As summarized in Table 1, our 18 interviewees included undergraduate students, Masters students, Ph.D students, parents of high school students, a housewife, employees with almost 10 years work experience, and elderly people retired for several years. In the following discussion, we refer to individuals as relevant by participant number.

Data Analysis

We applied grounded theory in this interview study; this method emphasizes the simultaneous processes of data collection and analysis [7]. We conducted initial data analysis sessions after the first few interviews to identify core themes. Learner motivations, perceptions, and learning behaviors were identified as the key concepts from the first stage of analysis. When those main themes were identified, axial coding was used to identify categories. Themes and categories were further refined through an iterative coding process that involved all the authors. The results presented as a coding guideline were used to guide the next round of coding. When the second round of the analysis were not able to find a new concept and category, it demonstrate the saturation of the theory [7].

FINDINGS

Motivations to Join MOOCs

We identified four broad types of student motivations for joining MOOCs: fulfilling current needs, preparing for the future, satisfying curiosity, and connecting with people. Note that although the following discussion treats each of these themes separately, it is quite possible that a student might choose to join different MOOCs for different reasons, perhaps even at the same time.

Fulfilling Current Needs

Course Complement

A common motivation for students to enroll in a MOOC is to complement other courses they are currently taking. Two primary rationales underlie this motivation. First, students feel pressure to achieve a high GPA or at least to earn the credits for a school course. The course content is frequently challenging and fast-paced, which may make it difficult for a student to keep up. MOOCs that cover similar subject areas can provide a high level overview that helps to them grasp their school course content more quickly. As an example, P5 was taking a Java course. He found it difficult to fully understand the programming concepts within the standard class period. So he enrolled in an Udacity MOOC, “Java programming for beginners” to help him succeed:

“It worked very well. The professor explained the concepts very well and I was able to watch repeatedly until I understood the concepts. I also practiced programming following the instructions of the professor. [MOOC] gave me some basic knowledge that was missing in my school class. I finished this course when my school class ended, and I got high marks!” [P5]

Second, a school class usually cannot cover all the knowledge in a particular field and different instructors have their own perspectives on how to arrange the course content. Some student participants felt the content in a class did not meet their needs well enough and they desired to learn more. For instance, P6 took an HCI class at his university, but he also registered an HCI course on Coursera. He liked that the MOOC professor taught in a different way and covered different topics. This helped him broaden his perspective of HCI.

Professional Needs

Another motivation of interviewees was more typical of Ph.D students, Masters students and others who are seeking to gain knowledge that will allow them to better fulfill their current job responsibilities. For example, a new project or an innovative idea may require a new kind of skill or require use of a new tool to create specialized environments or conduct a detailed data analysis. Our participants see MOOCs as effective and efficient resources to gain knowledge for such performance-related needs.

Two rationales underlie this motivation. First, although students may opt to enroll in a regular class to gain needed knowledge, a traditional class requires a prescribed investment of time and energy investment. For instance, P9 needed new statistical knowledge to analyze her dissertation data. She enrolled in a statistics class, but gave up in the second week because the class met three times a week, and she needed to spend 40 minutes to commute to each session. After class, she needed to return to her home campus quickly to manage TA office hours and meetings. She was running out of time quickly, so she dropped the class and bought a book on statistics to learn on her own. Her friend recommended her to join a MOOC, where she was able to access the course content when she had time:

“Previously, I had to audit or take a class in school even though I didn’t need credits and only wanted to learn something for my research. Now I can choose a MOOC based on my research needs and learn whenever I want. Many of my friends (they are also Ph.D. students) take MOOCs for their research. It’s really cool!” [P9]

Indeed, all of our Ph.D. and Masters students interviewees had registered for at least one MOOC to meet their current research needs (e.g., machine learning, statistical classes, programming languages, etc.).

Interviewees who are working also took advantage of MOOCs to better fulfill their job responsibilities. P4 works

in the security department of his company. He joined the company after he got his bachelor degree and received some training after starting the job, but this education only taught him how to monitor and solve security problems without providing the underlying rationales. He completed several security courses on Coursera, and now feels more confident about his work.

A second rationale in this category is that students tend to trust the quality of MOOC instruction. Because MOOCs are often created by professors who are renowned in the subject matter and employed by famous institutions, the participants believe that they will achieve equal or better education than they can get from classes at their own university:

“You definitely want to learn Machine Learning with Professor Andrew [Ng] at Stanford. He is very famous in this field. I took his class last year on Coursera. I also recommended his class to my friends. It’s a very helpful class for my research.” [P3]

Preparing for the Future

Impress Potential Employer

Many participants enroll in MOOCs to enhance their future employability. These individuals have strong wills to complete the course, because receiving the completion certificate vouches for satisfactory knowledge of the course content. Some participants (i.e. P3, P6, P9, P10) have the perception that the more MOOC certificates they receive, the more they will be able to impress their potential employers;

“If I only finished one course, a future employer would say ‘the guy knows this knowledge.’ But if I finished 10 courses and no one required me to do that, the future employer would probably think ‘this guy has strong self motivation and persistence.’ I might impress them this way”. [P6]

At the same time, interviewees (P1, P6, P9, P11) were well aware that a MOOC certificate is not official and might not even be appropriate for inclusion on a resume. Alternatively, they might list their finished MOOCs on personal websites, for example connecting their certificates to a LinkedIn profile, because they believe that future employers might view their online profiles.

Shape a Goal for College Application

We interviewed two mothers (P15, P16) whose children are in high school and will apply for college next year. Their children are interested in several different majors, but they do not know what the majors are like and how difficult the courses will be. These parents enrolled their children in MOOCs as a test run to explore college courses. MOOCs provide an opportunity for high school students to experience different courses and instructors, and perhaps to identify emerging interests. Parents also encourage their children to finish the most interesting MOOCs and to

include the certificates as a part of the support materials in their college applications:

“I am so happy I can help him...now he is taking Computer Science [101] offered by Stanford. He is enjoying the class so far. Hopefully he can find one [major] he truly loves.” [P15]

Satisfying Curiosity

One common motivation to register for a particular course is personal interest. Most of our interviewees have taken at least three MOOCs, and several interviewees said the reason they took the first course was that they were very curious about what MOOCs look like (P1, P2, P3, P6, P9, P16). When they learned about MOOCs from friends, professors, or news media, they tried to learn more about MOOCs as well as to gain benefit from the free and high quality education resource:

“I learned about MOOCs from New York Times, and they sounded amazing. You know, they are free and offered by famous institutions. I was very curious about such kind of education format, so I went to Coursera and registered for a course about American history. I also registered for other courses later, but for the first one, it was just for my personal interest and curiosity.” [P1]

Most interviewees thought that MOOCs opened a door for them, a door that allowed them to access valuable education resources they were always interested in but had found difficult to pursue in reality. For example, P13 has been a technical support in an insurance company for 10 years and described her reason for enrolling in a MOOC on art. She has always wanted to systematically learn art, but has not been able to find a suitable opportunity because she has never had spare time or the financial resources to attend classes. MOOCs matched all her needs perfectly: free, flexible and high quality:

“I was so excited when I learned about MOOCs from my friend. The fact was that I didn’t believe it at the beginning. But when I opened an MOOC account on Coursera and registered for the art class, I realized my dream would become true. I finally could learn art just for my interest without any finical burdens and time constrains. The feeling was so amazing. Thank MOOCs!” [P13]

Connecting with People

One of our more surprising themes is that learners sometimes enroll in MOOCs to find peers with common interests. They found that meeting someone with mutual interests makes them feel happy and connected. P17 is 62 years old and has been retired for several years; he recently moved to a small town to live nearby his daughter. He felt lonely in a new environment. He had always liked playing music and was a part of a band when he was in college. When he learned about MOOCs from the newspaper, he enrolled in a Guitar class with the goal of meeting people who also enjoy music, even though he already knows how

to play a guitar. He also planned to take future classes with the friends that he met in MOOCs.

“I never thought I could find friends online. Although we don’t meet face to face, I am very happy to share my thoughts with someone who knows music. Hopefully, our friendship can go beyond this class period and last for a long time.” [P17]

P13 works remotely for an insurance company. After finishing her daily work at home, she feels very isolated. To increase her social life, she works twice a week as a volunteer in a McDonald's house. But she still has a lot of spare time. Finally, she finds MOOCs are worthy of joining, where she can find a lot of interesting classes and friends! She finished a personal finance course and was taking Renaissance Architecture in Italy when taking the interview.

“Taking those classes has become part of my daily life. I know some friends there and we have some very interesting discussions which sometimes are related to courses but sometimes not. They do enrich my life.” [P13]

How Students Learn from MOOCs

Because different participants may have different motivations for taking any given MOOC, many interesting learning patterns emerged from our interviews. Some participants treat MOOCs as regular school classes, following a self-mandated course schedule, while others seem to appropriate MOOCs based on their current needs. MOOCs are used at times as modularized resources, edutainment, and a motivation for study groups. Students also integrate online resources other than MOOCs.

MOOCs as Regular School Classes

One common way for students to study in a MOOC is as if the online resource is a standard school class. These participants follow a fixed course schedule week by week. They usually arrange a fixed time in each week to watch videos, take notes, complete quizzes and assignments, and participate in forums. For example, P2 took a Social Network Analysis on Coursera; she watched course lectures on Monday morning, did quizzes and assignments in the afternoon, and sometimes joined discussion forum if she encountered problems. She successfully finished this course and also achieved valuable research insights from it.

“I was so excited to join this class. Although it is optional, I took it as a serious class and marked it on my calendar...I really treasured this opportunity to learn from such a famous professor. I also received useful comments from other students about my research. I felt happy when I watched the course videos, did assignments, and discussed with others every Monday”. [P2]

P7 is an undergraduate who took a personal finance course on Coursera that is unrelated to his major. He took four university courses and one from Coursera. He also inserted

this online course into his class schedule, completing the MOOC at the same time as the semester finished.

MOOCs as Modularized Resources

In some cases, participants did not care whether they could complete a course or receive a certificate. Instead, they wanted to learn something based on specific needs, such as understanding basic concepts, complementing a school course, learning a particular algorithm, gaining a general picture of a topic, or simply learning new materials.

“I just want to learn the basic rules of Java without doing any quizzes and assignments and participating in discussions. I learn it not because I am interested in it but I need to use it. So I just watch the lectures and get a general understanding of Java. That’s it.” [P10]

Some participants only focused on a few lectures that fulfilled their immediate needs and skipped others. For example, P11 just needed to learn linear regression to analyze her data, so she left the lessons on logistic regression unfinished in a statistics course.

MOOCs as Edutainment

Edutainment is content that is primarily educational but has incidental entertainment value. Our participants (P4, P6, P10, P14, P18) have appropriated some MOOCs (i.e., history, music, and art) for edutainment purposes. For these participants, they neither wanted to waste valuable time on watching videos purely for entertainment, nor invest long time periods to join regular courses that are unrelated to work or study. They chose to take advantage of the free and informative nature of MOOCs, treating them as edutainment videos to watch in their spare time (e.g., while eating breakfast, doing house chores, working out, resting, etc.). Typically, participants who treat MOOCs as edutainment only watch the lecture videos without completing quizzes and assignments.

“I am taking a MOOC about American history. My wife and I watch the videos every morning when we eat breakfast and wash dishes. Our breakfast is fun and educational! We enjoy them very much!” [P14]

“I also download videos on my phone and watch them when I work out. Previously I only listened to music, but now I find MOOCs videos are more attractive. You know, you can learn much unconsciously.” [P4]

MOOCs as an Opportunity to Interact with Others

Some participants feel lonely when they study MOOCs on their own. Although MOOC platforms (e.g., Coursera, edX, and Udacity) provide discussion forums, the majority of participants felt that discussion forums failed to facilitate interactive communication. They also had a desire to study MOOCs with their friends rather than complete strangers. To solve this problem, some participants joined or organized local study groups. In a sense by doing this they converted *virtual courses* into *actual courses*. For example, P9 joined a MOOCs study group of 12 organized by her

friend. Her friend organized the study group by sending emails that invited friends and classmates to join. The group consisted of graduate students from different departments, such as computer science, chemistry engineering and information sciences and technology. They created a mailing list to recommend and choose MOOCs to join as a group, and planned study events once a course had started. The group studied together once or twice a week at the university library. They watched lecture videos, worked on assignments and discussed problems together.

"We took Machine Learning together every week. That was a hard course, but studying with them was really beneficial to me. I don't think I was able to have finished the course without them." [P9]

In another example, P13 organized a learning group that included socializing as well as shared study. She recruited friends and colleagues to take a particular art MOOC. This class required students to make art crafts as assignments, so she invited her friends to meet at her home on Friday nights. They had dinner together while they watched the videos and then made crafts together. *"It's a kind of a party! But we also learn something."* [P13]

Going Beyond MOOCs to Support Learning

Many participants told us that they prefer to ask questions, search for answers, help others, or collaborate with group members via other tools or websites – that is they do not rely on the normal MOOC discussion forums. Because MOOCs involve many students and only a few course staff members or volunteers to provide answers, student posts to the forums are often ignored or not addressed in a timely manner.

Instead, participants often submitted questions to popular Q&A platforms like StackOverflow. Google Search is also a very common tool for finding answers to specific questions. As contributors our participants prefer answering questions via something like StackOverflow, which allows them to earn recognition points that might enhance their professional reputation. When students needed to collaborate, they used emails and Google Docs to work with online peers, primarily due to a lack of collaboration features in MOOC platforms:

"When I run into a problem, I usually search for it on Google first. If no answer satisfies me, I will go to StackOverflow. I can always get a good answer there. I don't rely on discussion forum because you never know whether and when you can get an answer." [P3]

Factors Influencing Retention Rate

Many of our participants were disappointed that they retook the same MOOC multiple times but never finished it, despite high motivation; others were satisfied with their learning even when they did not complete the course. We attempted to understand this phenomena in our interviews, identifying eight factors associated with retention problems: high workload, challenging course content, lack of time,

lack of pressure, lack of awareness features, social influence, long course start-up, and learning on demand.

High Workload

Our participants reported that some MOOCs required much more time than they had initially expected. Participants claimed that, although they were able to understand the course lectures, they could not fulfill their obligations related to the written assignments and peer assessments and had to drop out. For example, P18 enrolled in an academic writing course that required students to not only write critique articles based on the weekly readings but to also provide assessments for five other students' articles as well. This student spent at least 15 hours per week to complete the course requirements, which exceeded the 7 hours claimed by syllabus.

"Maybe because I am a responsible person and I took the peer assessment seriously, I needed a lot of time to finish my essay and help others. So I only took two lectures and I quit because I had other priorities, though the course was very helpful for my writing. I can tell even though I only took the class for two weeks." [P18]

Challenging Course Content

Participants left some courses because they were too difficult to follow. During online learning, participants had to slow down the video pace to half or even a quarter of the original pace to follow instructors, and also had to pause and rewind frequently to make sure they understood the point. This resulted in two significant consequences. First, they needed to spend double or triple the estimated time to finish a lecture, which resulted in falling behind the course schedule. Falling behind means they were unable to receive feedback from peers or teaching staff as the course progressed. Second, when they did not fully comprehend the course content, participants felt incompetent and discouraged, causing them to withdraw. For instance, P3 participant completed 6 of 10 MOOCs, but one of the unfinished courses was especially memorable to him:

"I took Cryptography last semester. That was a very hard course. Even though I watched videos as half pace, I still need to pause and rewind very frequently! This really made me frustrated. I began to think 'is it the right course for me? Should I take an easier one?' ...You know, my progress was slow, but time was limited because I still had other priorities... I was two weeks behind the course schedule and I asked questions but no one answered, I guess they were not on the same page with me. So I had to give up. I may try another time. Who knows!" [P3]

Lack of Time

Participants, especially student participants, perceived lack of time as a significant factor affecting their decision to withdraw. They would enroll in MOOCs during down times such as a winter break. The time available for their learning on MOOCs naturally decreased after school resumed. P1 enrolled in a Game Theory course during his vacation, but

the new semester began after two weeks. New courses and new activities filled his time so he had to discontinue his online learning. Similar reasons like finding internships, travelling, and preparing for final exams during semester final weeks resulted in them giving up on MOOCs.

"I had taken Python twice but failed both times. The first time was because I needed to go back school and I suddenly had five courses to take care of. So I didn't have extra energy to learn it. The second time was because I went to a company as an intern, so I stopped again." [P8]

Lack of Pressure

Another reason for leaving a MOOC before finishing was that the absence of pressure or urgency to complete a free course. For instance, once enrolled, MOOC participants can usually access the course materials anytime, even after the course officially ends. They do not need to finish the course within the limited time if their goal is not to obtain a certificate. Many participants intended to complete the course in their spare time, but this did not always happen:

"You know the videos won't disappear if you miss a deadline. You still have access to them. But the problem is I never went back after I stopped learning last year [laugh]". [P7]

In addition, most participants chose to take MOOCs as optional work that had no influence on their school records or job evaluations, so they did not always push themselves to finish the course.

"No one keeps you accountable. You don't have a grade on the certificate. Even if it gets graded, it does not affect my GPA here. There is no consequence for doing poorly on it or doing nothing at all. The reward is just a certification at the end. So when I quit, I don't think it's a big deal. I might feel a little bit sorry because I didn't finish a thing that I started." [P1]

No Sense of Community or Awareness of Others

As previous literature has pointed out, feeling a sense of community can help students to be more engaged in a class, enhancing retention and learning outcomes [10]. In our case, we also found that a lack of community feeling may have affected retention. As P8 described: *"In a real classroom, when you answer a question correctly, the instructor will praise you. When you did an excellent job on assignments, the grade and comments will encourage you. When you have a smart idea and share in class, you will feel proud. When you do assignment, you have your classmates sitting together to discuss. But in MOOCs, you feel nothing. You are alone."* [P8] In fact, most participants declared that they did not feel a sense of community while in a MOOC.

Our participants mentioned that it was difficult to get to know their MOOC peers, and that this affects their MOOC experience: *"In a classroom, you know the person sitting beside you is a real person. After you look over, you would*

have a feeling of how they would be, either friendly or not." [P12] Existing MOOC platform do not provide features to promote community awareness. Participants are unable to know how many students are studying online with them at any given point. *"I really wish I could see who they are, where they are from, and how many students are working with me when I study online. That might give me a feeling that I belong to this class and I had classmates."* [P11]

Some participants did try to browse the profiles of others who were enrolled in the same course, but they found most profiles to be incomplete, and there was no way to verify whether a name is fake or not. As a result, they also refused to provide their personal profile information: *"I don't provide any information and say hello in the forum. I don't know why. I guess I don't trust them just like they don't trust others, otherwise why would they not provide their own information?"* [P14]

It was also difficult for our participants to find suitable peers for group projects because the forum did not provide any useful student background. In many cases, they ended up completing the projects by themselves. *"This is a big problem for most of the MOOCs. They just want student to watch the videos and do the homework. They don't care about how you can find the right people to form a group."* [P7]

Social Influence

We found that participants tended to take a MOOC more seriously if it had been recommended by a respected family member or friend. *"I definitely trust his recommendation! He is my best friend and is a genius in programing."* [P8] If a respected peer recommended the course, the students would try hard to finish the course to meet expectations:

"One of my upperclassmen recommended this course and he completed this with high marks. Actually he had taken 12 MOOCs and finished them all! So whenever I felt that it was hard to continue learning this course, I would think of him to gain inspiration." [P18]

"If he can finish the course, I can finish it too. Otherwise, I am just being too lazy, right?" [P11]

Social influence can also have negative effects. For example, if the person recommending a course did not finish it, participants would find excuses to not complete the course as well. *"[Did you finish the course?] No, I didn't. My friend didn't finish it either. Er... I mean maybe the course were not suitable for the both of us."* [P12]

Lengthy Course Start-Up

Another factor affecting retention was that participants sometimes needed to wait for a long time to access the course after registration. For example, P11 registered for a Coursera Data Science course in March but had to wait for the course to open in April. She wanted to view the course content immediately to complement her current school course. After one month, she was finally able to enter the

course, but it only released the first week's materials. She left the course when she found out that she would need to wait for another three weeks to access the specific content she needed. *"I don't know whether I'll still need it after another three weeks so I left the course. I know I may lose a learning opportunity, but waiting really makes me frustrated. Why don't they put them [course materials] up all at once?"* [P11]

Learning on Demand

The participants in this case used MOOCs as modularized learning resources. They left the course once they had fulfilled their needs. *"I am only interested in the American history during the Cold War, I only studied those related lectures and skipped others. That was why I didn't finish the course. I have already reached my goal."* [P2]

DISCUSSION

In this study, we have identified a number of different learning motivations, summarized innovative approaches that students take when learning from MOOCs, and described multiple factors that seem to be threats or opportunities affecting retention during online learning. Although MOOCs are still in a developing stage, we believe that these educational offerings have great potential to help people improve their lives. As we suggested earlier, MOOCs can help high school students understand their interests; they can help to realize an expensive art dream with zero pennies; they can be edutainment products to make people's life nourishing and so forth. From our view, MOOCs are not merely education resources. They should be viewed as a flexible integration of educational content, technology support, and instructors' and learners' creations and activities. Our primary mission is to better understand learners' needs, and to use that understanding to fit the elements together in ways that meet many kinds of needs.

Decompose Motivation

We categorized learners' motivations into four broad types: fulfilling current needs, preparing for the future, satisfying curiosity, and connecting with people. Prior literature either does not focus on the learners' motivation [1, 4, 16, 25] or addresses them in a general way without careful consideration of rationale, making it difficult to inspire design implications. We have attempted to decompose the general notion of motivation into the many different rationales held by different kinds of students.

With respect to fulfilling current needs, we can see that MOOCs may evolve into a reliable learning channel to help individuals enrich professional knowledge. They can provide options for professional development beyond the more traditional selection of a book for self-learning or hiring a tutor. For students seeking to influence their future options, we saw that some participants believe that the more certificates they get, the larger chance they can impress the future employer. However, the real value of certificates on the job market has not yet been widely discussed. The developers of MOOCs need to carefully position the

"value" of their certificates, and businesses must be persuaded to value them in kind.

Shaping a child's interests in preparation for college is a particularly interesting motivation for MOOC learning. MOOCs offer a convenient way for high school students to gain some appreciation of multiple disciplines or majors. One implication is that institutions might deliberately build MOOC-based introductory courses for high school students, supporting the transition into college-level instruction.

The desire for social interaction as part of MOOC learning was another interesting discovery. Some learners' primary motivation may come from connecting with people rather than learning specific material. It may be that learning-based social interactions are particularly meaningful for some individuals. Future work could explore this unique phenomenon.

What Learning Patterns Tell Us

Prior research has explored MOOCs learning patterns. For example, [16] clustered four learning patterns applying learning analytics on three computer sciences (CS) MOOCs, including auditing, completing, disengaging and sampling based on their completion status. Their findings are limited because 1) the courses they choose belong to the same type but learners may have different study strategies for different types of courses (i.e. CS VS. Arts.); and 2) completion status only reflects completion rate and cannot give us insight into *how* learners reached that status.

To fill the gap, we have used qualitative methods to present a vivid picture of learning patterns. Our data analysis yielded five patterns. Three are at the individual level, including taking MOOCs as regular school classes, taking MOOCs as modularized resources and taking MOOCs as edutainment. MOOCs as modularized resources are confirmed by auditing proposed by [16]'s and lurker generated by [25].

These patterns may provide guidance for future studies that rely on more systematic learning analytics. For example, the interaction logs of learners who take MOOCs as regular school classes may convey a regular pattern; in contrast, for students viewing a MOOC as a modular resource, the log activity may peak during specific weeks; learners who take MOOCs as edutainment may carry out a much more limited set of actions (e.g., video view only).

We also identified a collaboration pattern, in that learners may join MOOCs as part of a formal or informal study group that works on learning goals together. This finding suggests that MOOC builders should devote more attention to features that promote a sense of community and collaborative interaction, for instance building behavior visualizations that capture student interactions over time as well as when they are online working at the same time.

The last pattern described the use of external tools (e.g., Google Doc, Google Search, Facebook) to support MOOC learning. This finding exposes drawbacks of current MOOC platforms (e.g., ineffectiveness of discussion forums), while also pointing to future design work: how do users appropriate these other tools to support their study, and is it feasible and desirable for MOOCs to provide these features? If not, how might we better integrate the other platforms as part of a larger MOOC ecosystem?

Factors Affecting Retention

We identified eight factors associated with low MOOC retention rates: high workload, challenging course content, lack of time, lack of pressure, lack of awareness features, social influence, lengthy course start-up, and learning on demand. Our findings are in accordance with prior research on the factors of difficulty [38], workload [34], and lack of time [34] with respect to course retention in traditional educational settings. Factors of difficulty and workload are also consistent with other research on MOOCs [1, 36]. However, other factors are inconsistent with this earlier work. The possible explanations are that 1) [25] focuses on cMOOCs retention, which may be rather different from xMOOCs retention; 2) [25] focuses on a single cMOOC and does not include learners who left the course. Other factors, such as social influence, little or no awareness of other students, lengthy start-up time and learning on demand, may be unique to the MOOC context.

Retention Problem versus Retention Opportunity

As discussed earlier, previous studies have observed very low retention rates for MOOCs [1, 4, 8, 9, 16, 19]. We propose that once we achieve an in-depth understanding of MOOC participants' motivation and behavioral patterns, the issue of retention should be addressed from two perspectives: retention as a *problem* and retention as an *opportunity*. The rationale behind this proposal centers on the variety of conceptions about what counts as "finishing" a MOOC. For some students, the concept of finishing is a good match to what the instructor likely believes – in other words, watching all the lectures, completing all the quizzes and assignments, and receiving a certificate. In contrast, others seem to feel that they are finished once they satisfy a learning goal, which may be as specific as a lesson covering an important computer algorithm. Still others may take the MOOC with a more amorphous goal, for instance wishing to gain insight into a particular area of study, but not feeling it necessary to view all lessons or complete all assignments. Indeed, some of our students told us that interacting with other students who share interests was a primary goal, rather than the goal of learning assumed by educators (recall, for instance the older man who took a music MOOC just to meet others interested in the guitar). Therefore, when we discuss retention issues in MOOCs, we must begin with a solid understanding of participants' learning goals and the implications for corresponding views of what counts as being "finished". Students who learn what they want and leave the course in the middle are not evidence of a

retention problem; instead they should be commended for taking advantage these free and easily accessed online resources. Drop-out cases like these should be viewed as retention opportunities. Of course we have also seen that many students do plan to finish all course content but give up during the learning process for a variety of reasons; these are the retention problems in need of attention.

Going back to prior literature on MOOC retention, Clow's [4] funnel model views learners as going through a four-stage process: awareness, registration, activity, and progress. Only some of them reach the fourth stage of meaningful learning. This model captures the problems of retention from a learning analytics perspective. However, we offer another interpretation: after gaining awareness of a MOOC opportunity and choosing to enroll, learners engage in activity that may lead them to drop off sooner or later with respect to the course structure. What counts as "meaningful learning" is a function of their learning goals, and the extent to which they are able to achieve those goals is a function of retention-related factors such as we discussed earlier. For example, some people register for a MOOC out of curiosity; their curiosity might be satisfied by quickly scanning some of the learning materials, causing them to drop out "early". In other cases, curiosity may also be a driving factor, but the MOOC is not set up for a quick browse of content, and the participant may drop out with a feeling of frustration. In short, the concept of "meaningful learning" is not defined by *time in the course* or *completion*, but rather by each participant's learning goals.

Our qualitative findings point to a need for future research on students who have "true" retention problems. It is not clear yet how such individuals can be identified, but it may be that pre-course surveys can provide a reasonable approximation. At the same time, we argue that educators and MOOC technology developers should direct at least some attention to the retention opportunities that inhere in the broad range of motivations that we have discussed. We turn now to the design implications of our findings.

IMPLICATIONS

Diversify Learning Modules to Support Diverse Goals

Because different participants bring different motivations to their MOOCs, they may benefit from different services. We propose two styles of modules based on the four general motivations we discussed: one style that is learning-driven and another that is certificate-driven. It is quite possible that the same content could be offered in both styles, allowing the MOOC to serve as many needs as possible.

For a learning-driven module, the MOOC schedule would be very flexible, without strict deadlines. In such a module, students could arrange their learning activities based on their own abilities, needs, and time. Such MOOCs should also be open to public at all times, allowing students who have immediate learning needs to access the course instantly and not wait for the next session being launched.

This module could solve several problems raised in interviews such as lack of time, lack of pressure of falling behind schedule, lack of confidence, and unnecessary waiting. Of course we recognize that providing this level of flexibility might imply even less direct involvement by an instructor, who cannot be expected to constantly be available to different students who are interacting and progressing at different rates. Thus a MOOC of this sort would need to rely much more on self-study materials or to provide much more support for peer discovery and interactions.

In contrast, for a certificate-driven MOOC, students who are eager to prepare for some future job or other educational activity may be willing to work in a very structured fashion so as to earn a formal recognition at the end. These courses would be similar to most current MOOCs and traditional courses offered by universities and other educational institutions. The course schedule in this MOOC would be formal, and assignments would need to be followed up with valid assessments of student performance. This will allow a completion certificate to be more valuable and worthy of pursuit.

Facilitate Social Interaction

Although MOOCs are built upon a tradition of opening up the academy through recorded lectures, they also can be seen as a new form of online community. We found that participants often wanted better support for peer communications and interactions, including setting up their own ad hoc mechanisms to experience the value of collaborative learning and discussion. For example, some participants join MOOCs for social needs, others join MOOCs as part of a cohort. Some support should be provided by MOOC platforms to facilitate social interactions.

Utilize social influence to stimulate learning passion.

Participants were usually excited when they started a MOOC, but their passion gradually died out because of the factors identified in our interviews. Most participants found it difficult to motivate themselves in continuous learning. MOOC designers should consider strategies to stimulate students' initiative and encourage them to learn. For example, constructivist theory [37] emphasizes that learners should be active and not passive, and that collaborative learning is one way to increase engagement. Indeed, we found that social influence may play an important role in MOOC experiences and retention. For example, the system might provide comparisons of learning progress among students, perhaps even using a leaderboard to indicate how the top performers are performing and what they have accomplished so far.

Enhance Sense of Community. Research on community informatics has confirmed a central role of sub-networks in forming community [3]. Students vary enormously in their background, value systems, current situations, and personal objectives. The occurrence of subgroups enables this

diversity to coalesce, emerge, shape and contribute to the richness and tenacity of a community. Subgroups offer opportunities for smaller-scale activities, such as idea sharing, brainstorming, and identity formation, which in turn benefit the larger community. Membership across groups will ultimately strengthen the overall community. MOOC designers might encourage subgroup formation by improving technology design, such as building virtual small-scale classrooms. This result is consistent with [16], who has suggested that MOOC platform designers consider building other community-oriented features to promote pro-social behavior, such as text or video chat, small-group projects, or facilitated discussions [16].

Provide Community Awareness Mechanisms. Community awareness mechanisms are one way to build community [3]. In other work we have talked with MOOC instructors and learned about related efforts for particular courses. For example, one instructor uses a map to emphasize how students are distributed throughout the world. This type of visualization not only raises awareness but also suggests a strategy for finding peers in the same geographic region. Another instructor developed a class roster that listed all registered students but then marked their performance with icons near their names. Participants from these two courses reported that the awareness of other students' performance gave them a better sense of how their learning community is doing. Even displaying the number of students online at any given moment might give them the sense that they are part of a larger collective with shared goals. Thus, future MOOCs should explore different community awareness mechanisms to create a more active and inter-connected learning context.

As Cormier and Siemens noted, "the actions of institutions like MIT suggest that the true benefit of the academy is the interaction, the access to the debate, to the negotiation of knowledge – not to the stale cataloging of content" [5]. When we better understand learners' needs for socializing, we can encourage communication and collaboration by leveraging the massive body of co-learners, and supporting interaction with appropriate technology, rather than solely focusing on content and delivery. There is a potential for a cMOOC and xMOOC hybrid concepts to emerge in the future, offering different balances of content delivery and conversational models of learning, to address a wider range of potential participants and topics.

LIMITATIONS AND RECOMMENDATIONS FOR FUTURE

Our interview study reveals a broad picture of learner motivations and learning patterns, as well as factors affecting retention in xMOOCs. While the study fills gaps in the literature and contributes a substantial body of new empirical data about the learning experience afforded by xMOOCs, some limitations must be acknowledged and considered. First, the sampling strategy used (snowball sampling) has likely produced a biased sample. We call for caution in generalizability of our results. Second, although

we tried to reach out to a wide age range of participants, not all age groups are well represented. Third, learners in different geographic regions may present different motivations, and learning patterns. However, our samples mainly locate in U.S., which limit our understanding regarding this issue. A more systematic future study could avoid these limitations. Furthermore, a quantitative study with a more varied and larger population would be a useful complement for this qualitative, explorative study. A broad survey of xMOOC users would be helpful to confirm and further develop our findings.

CONCLUSION

In this study, we have examined student motivations for participating in MOOCs; presented innovative approaches they take to their use of MOOCs; and recognized multiple factors as threats or opportunities that seem to affect student retention in online courses. Interestingly, many participants who enroll in MOOCs never have the intention to finish them at all, in the sense of conventional courses, even when the online courses are organized and marketed as conventional offerings (e.g., lectures and exercises). Indeed, we have documented a wide range of motivations for using MOOCs; course completion and certification is only one of those. Our findings are important because the “retention problem” of MOOCs can now be elaborated in a more articulated way; namely, these online courses enable a diversity of motivations that simply were not possible or appropriate in earlier educational paradigms. Our study suggests that researchers should consider retention issues in MOOCs from two perspectives: retention as an *opportunity* and retention as a *problem*. Also, MOOCs should be considered as a new type of virtual organization that is composed by educational contents, technology and learners, rather than a simple combination of learning materials and platforms. Building a deep understanding of user needs is crucial for future evolution of MOOCs.

REFERENCES

- Adamopoulos, P. (2013). What Makes a Great MOOC? An Interdisciplinary Analysis of Student Retention in Online Courses, In Proc. ICIS.
- Armstrong, J.S. (2012). Natural Learning in Higher Education, in Encyclopedia of the Sciences of Learning, Springer, pages 2426-2433.
- Carroll, J.M. (2012). The Neighborhood in the Internet: Design Research Projects in Community Informatics. Rutledge.
- Clow, D. (2013). MOOCs and the Funnel of Participation, in: Proceedings of the Third International Conference on Learning Analytics and Knowledge, pages 185-189.
- Cormier, D., and Siemens, G. (2010). The Open Course: Through the Open Door--Open Courses as Research, Learning, and Engagement, Educause Review (45:4), pages 30-32.
- Coetzee, D., Fox, A., Hearst, M. A., & Hartmann, B. (2014). Should your MOOC forum use a reputation system?. In Proc. CSCW 2014, pages 1176-1187.
- Corbin, J., and Strauss, A. (2007). Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory. Sage Publications, Incorporated.
- Daniel, J. (2012). Making Sense of MOOCs: Musings in a Maze of Myth, Paradox and Possibility. Journal of Interactive Media in Education.
- Downes, S. (2010). Learning Networks and Connective Knowledge, Collective intelligence and e-learning (2), pages 1-26.
- Du, H., Rosson, M.B., Carroll, J.M. & Ganoë, C. (2009). I felt like a contributing member of the class: Increasing class participation with Class Commons, In Proc. GROUP 2009, pages 233-242.
- Fox, A., and Patterson, D. (2012). Crossing the Software Education Chasm, Communications of the Acm (55:5), pages 44-49.
- Haywood, J. No such thing as a free MOOC. <http://www.jisc.ac.uk/blog/no-such-thing-as-a-free-mooc-20-jul-2012>
- Huang, J., Dasgupta, A., Ghosh, A., Manning, J., & Sanders, M. (2014). Superposter behavior in MOOC forums, In Proc. L@S 2014, pages 117-126.
- Iiyoshi, T., and Kumar, S.V. (2008). Opening up Education: The Collective Advancement of Education through Open Technology, Open Content, and Open Knowledge. Mit Press.
- Joglekar, M., Garcia-Molina, H., and Parameswaran, A. (2013). Evaluating the Crowd with Confidence, In:Proc. SIGKDD 2013, pages 686-694.
- Kizilcec, R. F., Piech, C., & Schneider, E. (2013). Deconstructing disengagement: analyzing learner subpopulations in massive open online courses. In Proceedings of the third international conference on learning analytics and knowledge, pages 170-179.
- Knowledge@Wharton. (2013). MOOCs on the Move: How Coursera Is Disrupting the Traditional Classroom, Innovation and Entrepreneurship. Articles Retrieved from
- Knox, J., Bayne, S., Macleod, H., Ross, J. & Sinclair, C. (2012). MOOC Pedagogy: the challenges of developing for Coursera.
- Lewin, T. (2013). Universities Abroad Join Partnerships on the Web, in: The New York Times February 21, 2013, page A18.
- Mak, S., Williams, R., & Mackness, J. (2010). Blogs and forums as communication and learning tools in a MOOC. In Networked Learning Conference, pages 275-285.

21. Martin, L.; Roldán Martínez, D.; Revilla, O.; Aguilar, M.J.; Santos, O.C.; Boticario, J.G. (2008). Usability in e-Learning Platforms: heuristics comparison between Moodle, Sakai and dotLRN. In OpenACS and .LRN conference, pages 75-84.
22. Masters, K. (2011). A Brief Guide to Understanding Moocs, *The Internet Journal of Medical Education* (1:2).
23. McAuley, A., Stewart, B., Siemens, G. & Cormier, D. (2010). The MOOC Model for Digital Practice. Retrieved from http://www.elearnspace.org/Articles/MOOC_Final.pdf
24. Means, Barbara; Bakia, Marianne; Murphy, Robert (2014). Learning Online : What Research Tells Us About Whether, When and How. Retrieved from <http://www.ebilib.com>
25. Milligan, C., Margaryan, A., & Littlejohn, A. (2013). Patterns of engagement in massive open online courses. *Journal of Online Learning with Technology*, 9(2). Online HTTP: http://jolt.merlot.org/vol9no2/milligan_0613.htm
26. Müller, D., Law, E.L., Strohmeier, S. (2010). Analysis of the Persuasiveness of User Experience Feedback on a Virtual Learning Environment. In Proc. I-UxSED pages 30-39.
27. Piech, C., Huang, J., Chen, Z., Do, C., Ng, A., and Koller, D. (2013). Tuned Models of Peer Assessment in Moocs, In 6th International Conference on Educational Data Mining.
28. Rosson, M.B.(2014), Building Community within Large Groups of Online Learners. In Proc. CHI 2014 Learning Workshop.
29. Russell, D.M., Klemmer, S., Fox, A., Latulipe, C., Duneier, M., and Losh, E. (2013). Will Massive Online Open Courses (Moocs) Change Education?, In Proc. CHI 2013 Extended Abstracts on Human Factors in Computing Systems, pages 2395-2398.
30. Satchell, C., & Dourish, P. (2009). Beyond the user: use and non-use in HCI. In Proceedings of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group: Design: Open 24/7, pages 9-16.
31. Siemens, G. (2011). The race to platform education. eLearnspace. <http://www.elearnspace.org/blog/2011/10/13/the-race-to-platform-education/> accessed 2012-09-21
32. Siemens, G. (2012). MOOCs are really a platform. eLearnspace. <http://www.elearnspace.org/blog/2012/07/25/moocs-are-really-a-platform/> accessed 2012-09-21
33. Singh, R., Gulwani, S., and Solar-Lezama, A. (2013). Automated Feedback Generation for Introductory Programming Assignments, *SIGPLAN Not.* (48:6), pages 15-26.
34. Tresman, S. (2002). Towards a Strategy for Improved Student Retention in Programmes of Open, Distance Education: A Case Study from the Open University Uk. *The International Review of Research in Open and Distance Learning* (3:1).
35. Van Schaik. (2009). Unified theory of acceptance and use for websites used by students in higher education. *Technology Acceptance in Education*, pages 159-181.
36. Vihavainen, A., Luukkainen, M., and Kurhila, J. (2012). Multi-Faceted Support for Mooc in Programming, In Proceedings of the 13th annual conference on Information technology education, pages 171-176.
37. Vygotsky, L.S. (1978). *Mind in Society: The Development of Higher Psychological Processes* (Translated by M. Cole, V. John- Steiner, S. Scribner & E. Souberman). Harvard University Press, Cambridge, MA.
38. Xenos, M., Pierrakeas, C., and Pintelas, P. (2002). A Survey on Student Dropout Rates and Dropout Causes Concerning the Students in the Course of Informatics of the Hellenic Open University. *Computers & Education* (39:4), pages 361-377.
39. Yuan, L., Powell, S., & CETIS, J. (2013). MOOCs and open education: Implications for higher education. Cetus White Paper.
40. Yuan, L., Powell, S., & Olivier, B. (2014). Beyond MOOCs: Sustainable Online Learning in Institutions. Cetus publications. Retrieved February, 8, 2014.
41. Zaharias, P., and Mehlenbacher, B. (2012). Exploring User Experience (UX) in virtual learning environments. *Int. J. Human-Computer Studies*, pages 475-477.