



Communication patterns in massively open online courses



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ABSTRACT

Despite the hype and speculation about the role massively open online courses (MOOCs) may play in higher education, empirical research that explores the realities of interacting and learning in MOOCs is in its infancy. MOOCs have evolved from previous incarnations of online learning but are distinguished in their global reach and semi-synchronicity. Thus, it is important to understand the ways that learners from around the world interact in these settings. In this paper, we ask three questions: (1) What are the demographic characteristics of students that participate in MOOC discussion forums? (2) What are the discussion patterns that characterize their interactions? And (3) How does participation in discussion forums relate to students' final scores? Analysis of nearly 87,000 individuals from one MOOC reveals three key trends. First, forum participants tend to be young adults from the Western world. Secondly, these participants assemble and disperse as crowds, not communities, of learners. Finally, those that engage explicitly in the discussion forums are often higher-performing than those that do not, although the vast majority of forum participants receive "failing" marks. These findings have implications for the design and implementation of future MOOCs, and how they are conceptualised as part of higher education.

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1. Introduction

Since 2011, massively open online courses (MOOCs) have been a subject of both hope and concern. Advocates like Thomas Friedman have enthusiastically labelled MOOCs as the revolutionary forces that will disrupt traditional practices in higher education and others have begun to investigate how they may help people in the developing world gain access to education (Ryan, 2013). Others, like philosophy professors at San Jose State University, have expressed public concern and frustration over the displacement of diverse, personalized pedagogy with one-size-fits-all courseware, reminiscent of David Noble's prophecy of online learning as a harbinger of "Digital Diploma Mills" (Noble, 1998).

If the evolution of MOOCs follows Gartner's hype cycle (Fenn, Raskino, & Gammage, 2009), then the polarised response to such courses is to be anticipated. Media coverage of MOOCs has fuelled both hype and qualified disillusionment as members of the media, academia and industry have offered their perspectives on the future of higher education.

However, similar to previous online initiatives in higher education before the introduction of MOOCs, many of these discussions have not been grounded in educational theory or a systematic, rigorous

investigation of this courseware's potential to enhance learning. Yet, as history has told us, empirical investigation of the actual realities of such initiatives is essential to move the debate forward (Selwyn, 2011).

In this paper we aim to contribute to this goal, through focusing on one central aspect of MOOCs which we suggest are different to previous incarnations of online open education. Prior to the introduction of MOOCs, learning via open education initiatives tended to be a relatively individual experience, where students navigated content primarily on their own. MOOCs are different from preceding open online learning efforts because they potentially enable a global student body to learn through online videos and assessments, as well as forum discussions with other students and course staff while a course is "in session". We propose that this structure encourages semi-synchronous interactions between course participants that may ultimately affect the ways in which they learn. While a number of theoretical educational perspectives shed light on the role of discussion in learning, this notion has not been thoroughly investigated in the context of global online education.

2. Background

MOOCs can be viewed as the newest incarnations of earlier attempts at open education at a distance, which has previously included MIT OpenCourseware (OCW), iTunesU, and Carnegie's Open Learning Initiative (Abelson, 2008; Johnstone, 2005; McKinney, Dyck, & Luber, 2008). MOOCs are hybrids of previous attempts at online distance education:

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they bring together early approaches to online learning and the scale and potential reach of open courseware efforts. Many online learning efforts started off as being synchronous, and therefore, engendered group discussions, but the scale of these discussions was small, and the participants often geographically homogeneous. The rise of global-scale open educational resource repositories like OCW and iTunesU offered access to content “to the masses” but failed to create a space, at least at their onset, where learners could engage with new content *together*.

While most MOOCs so far have focused on conveying university-level content, we suggest that their potential perhaps lies in enabling the creation of new knowledge and insights through online learner interactions. It is perhaps these interactions in MOOCs—conversations that are framed by course content, between thousands of people from around the world, each with unique life experiences and sociocultural contexts—that separate them from previous distance learning efforts and thus deserve significant research attention. While MOOCs are not entirely synchronous in comparison to most offline settings since they enable learners to watch lectures and participate in discussions according to their own schedules, they do have a defined start and end date, and many encourage students to partake in weekly assignments as the course progresses (Kizilcec, Piece, & Schneider, 2013). To begin to understand what MOOCs mean for education then, it is important to first learn how participants in these settings come together, discuss concepts, and form communities. Indeed, some students in MOOCs spend as much or more time on using the discussion forums as they do viewing lectures or doing homework (Seaton, Bergner, Chuang, Mitros, & Pritchard, 2013), suggesting that the discussion component of these courses is a particularly important area of study.

There are a number of theoretical frameworks that highlight the value of social interactions to support learning (Leont'ev, 1978; Vygotsky, 1978) that can and have been used to understand how individuals interact and learn in online discussion forums. For example, in Stahl's work on computer-supported collaborative learning (CSCL) he demonstrates how learners can collaboratively create knowledge as they interact online (Stahl, Koschmann, & Suthers, 2006). Stahl is particularly explicit in highlighting the differences between cooperation in these learning settings—where individuals are largely responsible for working on their own within a group setting in order to gain knowledge—and collaboration, which, as Roschelle and Teasley (1995) explain, involves group-directed negotiation and the construction of shared goals and meaning. These notions of interaction are especially important when analysing how learners in MOOCs engage with their peers. It is unclear if and when collaboration or cooperation takes place among thousands of learners, nor is it obvious under which conditions each type of interaction occurs.

Another important interaction framework to consider is one of “communities of practice” (CoP), or groups of individuals that share a common profession or trade and engage in collaboration to achieve a shared set of objectives (Lave & Wenger, 1991). The concept of CoP in recent years has been broadly interpreted, adapted, and applied to better understand how people learn with each other online (Thomas, 2005). An outstanding question, however, is if the notion of a CoP—a structure that is characterized by increased engagement and collaboration among its participants over time—can apply to discussions in a massively open online learning setting. In the past decade, some scholars have noticed the potential conflict between previously-held frameworks (like CoP) for describing and understanding learning in light of today's society—a society defined, in part, by interconnected webs of knowledge and information, many of which can be accessed instantly, on-demand. Connectivism has emerged as an alternative learning theory that emphasizes the role of the individual as an actor in a larger, imperfect, uncertain, and sometimes chaotic network of knowledge sharing (Siemens, 2005). Each of these theories then, focuses on relationships between learners and how these relationships affect various participation and interaction modalities. Together, they highlight the need to examine

the nature of learner interactions in MOOC forums and to understand the learning implications of such activities.

Methodologically, there are a number of approaches to analysing online interactions. Content or discourse analysis has been used in previous higher education research in order to understand learner interactions that take place online (De Weaver, Schellens, Valcke, & Van Keer, 2006; Gunawardena, Lowe, & Anderson, 1997). While valuable, such techniques would be practically impossible in MOOCs due to the thousands of participants. MOOCs offer researchers fine-grained data collected on learners' participation and mutual interactions (e.g. Breslow et al., 2013; Kizilcec et al., 2013) that have never been available at such scales before. These “digital traces” that were once virtually impossible to capture in campus-based contexts—such as the number of students that opened a textbook before the final exam, or which students spoke to which other students about the final problem set—are now available at unprecedented levels of detail within the MOOC setting.

While these digital traces could be analysed in a variety of different ways, here we employ network analysis. Network analysis has exploded in recent years as a method of investigating how individual actors—including those in educational contexts—interact with one another (Easley & Kleinberg, 2010). Social network analysis (SNA) in particular helps model the spatially and temporally influenced social relationships (edges) between individuals (nodes). From such analysis it is possible to understand who is talking to whom in a MOOC and how these interactions develop and change over time. Previous studies in education have leveraged these techniques, albeit with small-scale datasets (Cho, Gay, Davidson, & Ingrassia, 2007; Palonen & Hakkarainen, 2000). The rise of “big data” (boyd, and Crawford, 2012) in recent years and the tools that enable its analysis have encouraged more recent large-scale investigations that leverage the theory and practice of SNA in learning contexts (Kossinets & Watts, 2006; Vaquero & Cebrían, 2013). Therefore, MOOCs, and the discussions they harbour, are well-suited to benefit from the methodological advances that have fuelled the growth of big data research and network analysis in recent years.

2.1. Research questions

This study examines data from a MOOC with an emphasis on real-world learning in order to generate initial insights into who uses the discussion forums, how, and for what purpose. The investigation is primarily exploratory in nature; it employs observations, surveys, and social network analysis to gain insights into the structural attributes of communication between learners. It also explores the demographic characteristics of forum participants. Finally, because many learners appear to take MOOCs for different reasons and with different levels of formal engagement (Belanger & Thornton, 2013; Breslow et al., 2013), we investigate how forum participation relates to the students' final marks in the course. Our research questions are as follows:

1. What are the demographic and educational characteristics of students that participate in MOOC discussion forums?
2. What are the discussion patterns that characterize students' participation in the forums?
3. How does participation in discussion forums relate to students' final scores in the course?

3. Methodology

This research takes a case study approach in order to address the three research questions outlined above. Such an approach is particularly appropriate given the relative newness of the topic (Yin, 2009). The subject of the case study is on a purposively selected Coursera-based MOOC on Business Strategy that aimed to promote interaction and learning around real world business problems; using both weekly discussions of business cases in course forums and a peer-assessed final project that enabled students to conduct a strategic analysis of any

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