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Psycho-Social Aspects of Learning in MOOC Courses

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Abstract

Recent researchers emphasize the need for Massive Open Online Course (MOOC) designers and instructors to consider the impact of MOOCs on psycho-social aspects of participant learning and behavior in today's 24/7, mobile environment. This article examines research findings related to the skill sets, characteristics, and preferences of individual MOOC users that impact their success in this learning setting; the impact of learner motivation and level of engagement in the course; and how the context of a MOOC learning experience can vary in terms of time/location/modality. The implications for MOOC designers, instructors, and researchers are presented, along with future research directions.

Keywords

MOOCs, Online Learning, Learning Context, Mobile Learning Environment

1. Introduction

MOOCs (massive open online courses) were first developed by Canadian educators George Siemens (2005) and Stephen Downes (2006) as a way of implementing connectivist pedagogy, which views learning as totally learner-driven and consisting of the building of connections, with other people, information, and systems. In connectivism, learning is self-directed and not dependent on direction from a knowledgeable expert. This type of MOOC is mostly unstructured, with students themselves creating a learning network as they share and build knowledge and connections. Connectivist MOOCs are often not associated with a particular university and are free and open to registration by anyone who cares to participate. A second major category of MOOCs is a type of mass enrollment course offered by major universities that features pre-taped lectures, a pre-defined body of topics to be covered, online quizzes, and other online assignments. Instructors at Stanford University held an xMOOC in 2011 and then formed Udacity, a for-profit company that provides a platform for xMOOCs. Coursera is another for-profit xMOOC platform that originated at Stanford. MIT and Harvard collaborated to form edX, an open source not-for-profit MOOC platform. Future-learn is based at the Open University, but works with a consortium of universities in the United Kingdom.

Despite the hype about MOOCs over the past few years, many reports from both instructors and students about both connectivist MOOCs and xMOOCs indicate that students often feel lost in MOOC courses and express the need for more structure and guidance (Mackness, Mak, & Williams, 2010; Kop, Fournier, & Mak, 2011; Kop, 2011; Bayne & Ross, 2011; Koutropoulos et al., 2012; Ross et al., 2014; Bali, 2013, 2014; Liyanaganawandera, Adams, & Williams., 2013; Veletsianos, Collier, & Schneider, 2015). Statistics for MOOC course completion have been estimated to be around 10% (Chafkin, 2013; Marcus, 2013; Parr, 2013; Breslow et al., 2013; Koller et al., 2013; Pretz, 2014; Shrader, Owens, & Santa Ana, 2016). Issues raised by instructors and students, as well as high dropout rates, point to the importance of research into how to maximize and facilitate learning in MOOC environments. Much research has used data logs to examine the number of interactions between

instructors/students and students/students and clickstream data that reveals patterns of interaction (Veletsianos, Collier, & Schneider, 2015). Other research has examined the content of interactions, mostly with the goal of understanding why students drop out of MOOCs (Kamel Goulos, & Wheeler, 2007; Kizilcec, Piece, and Schneider, 2013; Yang, 2013; Perna et al., 2014; Onah, Sinclair, & Boyatt, 2014; Kizilcec & Schneider, 2015; Hone & El Said, 2016). More recently, researchers are examining psycho-social factors that can explain learner behavior in, attitude toward, and success in, MOOCs (Veletsianos, Collier, & Schneider, 2015; Terras & Ramsay, 2015; Ramsay & Terras, 2015). A psycho-social approach is particularly pertinent, given today's revolutionized, mobilized learning environments, in which learners use wireless devices to engage in learning in various contexts–psychological, social, physical and temporal (Terras & Ramsay, 2014b, 109). Such an approach seeks to identify how individual differences in MOOC learners impact how they engage and learn in a MOOC environment and builds on the recognition that MOOC learners are widely diverse and can differ across many dimensions, such as skills (digital and participatory) /preferences/learning styles, motivation and engagement, and the context of their learning.

To address these issues, this research seeks answers to the following questions:

1. Which skill sets, characteristics, and preferences of individual MOOC users impact their success in this learning setting, and what are the implications for MOOC designers and instructors?
2. How do a MOOC learner's motivation in taking the course and level of engagement in the course impact learning? What can MOOC designers and instructors do to maximize motivation and engagement in a MOOC?
3. How does the context of a MOOC learner's learning experience vary in terms of time/location/modality--both inside and outside the MOOC? What can MOOC designers and instructors do to maximize learning in various contexts?

The following sections of the paper examine research related to each of the above questions and present researchers' suggestions, based on their results. The paper finishes with future research directions.

2. Psycho-Social Factors in MOOC Learning

2.1. Skills (Digital and Participatory) and Preferences/Learning Styles

2.1.1. Digital Skills

Three concurrent trends are changing the landscape of adult learning. First, companies are undergoing digital business transformation in order to gain and maintain a competitive edge (Berry & Mok, 2018). Second, the digitalization of business and industry necessitates continuous upskilling and reskilling of employees to prepare them to use rapidly evolving technologies effectively. Workplace training and the creation of a corporate atmosphere that supports ongoing learning have become important priorities for many enterprises (Berry & Mok, 2018). Third, Information and Communication Technology (ICT) (computers, digital information, and educational and social tools that facilitate communication and collaboration among users) has vastly increased online learning opportunities, such as MOOCs, that are available, both to college students and to employees on the job (Steinke & Bryan, 2014).

As a result, educational program providers such as MOOCs need to take into consideration the potentially wide span of digital skill levels represented in students. College students and many younger employees may fit in the category of what are called "digital natives," a term which refers to persons born between the late 1970s and the early twenty-first century for whom computers have always been an integral part of life and who are often skilled in using ICT and other digital technologies (Bennett, Maton, & Kervin, 2008). Older individuals, on the other hand, may have finely honed on-the-job skills, but may lack the digital dexterity of younger students. At the same time, it has been argued that although many of today's "digital natives" (Bennett, Maton, & Kervin, 2008) are quite adept at using digital media in social aspects of their lives, it is a mistake to assume that they know how to use technology in the context of learning or have the skills necessary to do this (Terras et al., 2011), including critical thinking, reasoning, focus, self-regulation, and evaluative skills (Terras, Ramsay & Boyle, 2011); skill in the

effective use of technology in learning settings (Ramsay & Terras, 2015); or participatory skills such as collaboration and teamwork (Pegrum, 2009, 2011), which are required in content creation sites like those in MOOC discussion forums (Beaven et al., 2014). The takeaway from this for MOOC designers is that they should not make blind assumptions about the level of digital skills of students, based on age or level of education, but rather should, when possible, assess student digital skill levels prior to the course and be prepared to provide additional support to students who need it.

Most MOOCs have discussion forums, blogs and wikis, but may also include one or more of the many types of software available for educational purposes, particularly for online group discussion support. The Centre for Learning and Performance Technologies lists two hundred top software used for learning, one hundred of which are actively used in education (Centre for Learning and Performance Technologies, 2017). MOOC participants sometimes prefer to use participation support outside the MOOC, rather than the MOOC discussion forum. Examples of potential software they can choose to use for collaboration include Internet Relay Chat, Google Hangout, StackOverFlow, Google Search, Slack, InVision, Google Keep, Trello, appear.in,Yammer, Red Pen, Mural, GoVisually, MindMeister, ConceptBoard, Ideaflip, Scribblar, BinFire, Basecamp, Proofhub, Concept inbox, Cage, Draftboard, Marqueed (Stewart, 2016); and Web Ex, GoToMeeting, Flowdock, Asana, Dapulse, Redbooth, Simi, Codingteam, Igloo, Google Docs, and Quip (Bika, 2017).

2.1.2. Participatory Skills

Educators have long recognized the crucial role of dialogue and social interaction in learning (Vygotsky, 1978; Lave & Wenger, 1991; Wenger, McDermott, & Snyder, 2002; Lim et al, 2014). Kizilcec, Piece, & Schneider (2013) and Joksimovic, et al. 2015) also found a strong correlation between discussion forum participation and learners' engagement and completion of a MOOC. The collaboration that is part of learning in a MOOC facilitates the development of critical thinking skills, co-creation of knowledge and meaning, reflection, and transformative learning (Vygotsky, 1978; Lave & Wenger, 1991; Wenger, McDermott, & Snyder, 2002;). However, many MOOC researchers have found that learners often lack the collaborative skills needed to succeed in online group work, particularly if they do not know the other learners and lack the sense of community that is crucial for effective collaboration (Palloff & Pratt, 2005; Chapman, Ramondt, & Smiley, 2005). Students assigned to a group project without the necessary readiness and/or guidance may not accept or appreciate peer opinions about their ideas/work.

The following paragraphs provide further evidence of difficulties MOOC learners encounter in group collaborations.

Discourse analytics have validated the following as predictors of dropping out of a MOOC: motivation and cognitive engagement (Wen, Yang, & Rose, 2014a), student attitudes toward course tools (Wen, Yang, & Rose, 2014b), satisfaction with help received, and relationship formation and loss (Yang et al., 2014). Relationship formation and loss are the strongest factors. To address the issue of relationship formation, Rose & Ferschke (2016) compared the use of Quick Helper, Bazaar Collaborative Reflection, and a typical MOOC discussion forum to provide learners options for collaborative discussion engagement. Quick Helper can help reticent students pose questions to other participants. Bazaar Collaborative Reflection is an automatic facilitator for synchronous collaboration in which students are matched and taken to a chat room to collaborate. This research was based on the premise that providing learners a diverse set of discussion contexts can facilitate the social engagement needed for overcoming difficulties with material and course procedures (Breslow et al., 2013) and enhance the elicitation of articulation of reasoning and idea co-construction that are crucial for collaborative learning (Chan et al., 2013; Chinn & Clark, 2013).

Brindley, Walti, & Blaschke (2009) found that some MOOC students were not positive about working with a group on a final project. The authors propose a number of ideas for how to facilitate novice MOOC learner readiness for group collaboration and support them in this process. In preparation of a MOOC course, designers should sequence activities so that group collaboration occurs later in the course; and make group tasks relevant for learners, allowing as much choice as possible. Before the start of a MOOC, instructors should coach learners on planning and negotiation to prepare them for success in a group envi-

ronment (Curtis & Lawson, 2001); support the acquisition of specific IT literacy skills that are part of the MOOC, such as how to retrieve, evaluate, apply, and source information correctly; use ice breakers, seedings, and statements about participation expectations, etiquette, and behavior guidelines (Chapman, Ramondt, & Smiley, 2005); and build a balance between structure and learner autonomy by providing guidelines for completion of group assignments. Having personal control of the task can increase engagement, responsibility, and a sense of relevance of the task (Brindley, Walti, & Blaschke, 2009); and the establishment of a sense of community can be facilitated by discussing and reinforcing informality, familiarity, honesty, openness, heart, passion, dialogue, rapport, empathy, trust, authenticity, disclosure, humor, and diverse opinions (Brindley, Walti, & Blaschke 2009). During the MOOC, instructors should monitor group activities actively, provide feedback, and allow sufficient time for the completion of the group task.

Wintrup et al. (2015) interviewed a small group of learners, finding that they viewed fellow learners and MOOC instructors as important for their success. Wintrup et al. (2015) suggested encouraging learners who tend to learn on their own to be more interactive with peers, within and outside the MOOC, by including learning-suggested activities like Google Hangout, suggesting that learners share them with others outside the MOOC, and encouraging learners to experiment with the course forum and with the technologies that support learning. Other suggestions include giving thorough explanations on how to use resources like videos and structure a debate with peers; providing MOOCs content in as wide a range of formats as possible to appeal to all learners (diverse and disabled); telling learners what is expected of them and how long an activity should take; and modelling netiquette. Coetzee et al. (2015) performed controlled experiments to examine the use of synchronous peer learning support for discussion forums, finding that incentivizing learners to help one another and small group discussion of multiple-choice answers improved results compared to when students studied alone. These results are consistent with the idea that collaborative learning does not occur just by putting learners together without supportive instruction (Fischer, 2013, 2014; Johnson, Johnson, & Smith, 1998). Kellogg, Booth, & Oliver (2014) also found that interaction must be built into the learning context, or it may not occur, and that learners respond more readily to posts of people with whom they feel a connection. They suggest asking participants to post information about themselves, and that expectations and guidelines should be established for posts and interactions.

Bates (2015), Ross et al. (2014), and Firmin et al. (2014) emphasize that, without structure, students often become lost in discussion forums, overcome by information overload, and unable to learn. To facilitate learner engagement in deep, conceptual learning, a subject expert is needed to clarify misunderstandings or misconceptions, provide accurate feedback, ensure that criteria for academic learning (evidence, clarity of argument, etc.) are being met, and that input and guidance are provided that foster deeper understanding (Harasim, 2012).

Gillani & Eynon (2014), Gillani et al. (2014a) and Gillani et al. (2014b) studied demographics of nearly 90,000 users, discussion patterns in forums, and the relationship between discussion patterns to final scores in the course. A high attrition rate was noticed, which the researchers attribute to learners' not achieving community of learner status, and to the fact that no support was given to learners in the discussion board. Brinton et al. (2014) also noticed a steep decline rate, noting the high-volume, noisy environment of discussion forums—30% of them have too much information, making it infeasible for students or instructor. Additionally, the researchers found that a large amount of discussions are not course-related.

Rose & Freschke (2016) emphasize the need for efforts to increase media interactivity and to direct students to interactions that are potentially of personal benefit. They point out that threaded discussions in current MOOCs are not well integrated with instructional activities. (Rose, et al., 2015b). Connectivist MOOCs tend to include blogs, social media, Facebook, and Twitter, which provide individual learners more choices, although they often feel disoriented and overwhelmed. Currently, there is no coherent vision for seamless, effective integration of Web 2.0 tech with MOOC-based instruction. Furthermore, the use of social media is eclectic and fragmented, leaving students without a clear picture of where to go to engage in discussion that in-

terests them (Smith & Eng, 2013).

2.1.3. Individual Differences/Preferences/Learning Styles

MOOC participants are drawn from learners around the world, with many individual differences and preferences that impact their use of, and learning in, MOOCs. It is important to find ways to examine individual learner levels of prior knowledge (Kalyuga, 2006) and cognitive ability, preference, and style (Mayer & Massa, 2003; Chan et al., 2013), in order to enable appropriate personalization of their MOOC learning experience. Zheng et al.'s (2015) interviews of MOOC participants identified many differences in preferences, learning styles, and preparedness for group activities included in the MOOC. For instance, many students expressed a preference for asking questions, searching for answers, helping others, or collaborating with group members using other tools like StackOverFlow, Google Search, or Google docs instead of the MOOC discussion forums. These researchers identified what was lacking in the MOOC discussion forum—a sense of community, suggesting the need to stimulate initiative and encourage students to learn. Subgroups could be formed in the discussion forum to enable learners to bond, by engaging in idea sharing, brainstorming, and identity formation. Community awareness mechanisms such as a map of participants' locations, posting of who is online, or comparison of progress toward course task completion could also create a sense of belonging. Zheng et al. (2015) also suggest the possibility of diversifying learning modules to support the diverse goals and motivations of students by offering a learning-driven module in which the MOOC schedule would be flexible, so students could arrange learning activities based on their own abilities, needs, and time; and a certificate-driven MOOA to help prepare students for career activities, with a stricter schedule and more formal assignments. Wintrup et al. (2015) also call for providing MOOCS with content in as wide a range of formats as possible in order to appeal to and address the needs of all learners, including diverse learners and those with special needs.

Kulkarni et al. (2015) examined the use of Talkabout, a group video discussion system that is built on Google Hangouts and combines synchronous meetups but also makes forums available. With Talkabout, instructors can decide group size, discussion time and length, and the number of discussions for the duration of the course. The Hangout application guides and monitors discussions. Students can be assigned by gender, geography, or with students they have held discussions with earlier. Students can choose when they want to participate. Results showed that students enjoyed interactions with students in different countries and scored better, the more diverse the discussion group was.

Fischer (2013, 2014) notes that most forms of support for online collaboration are static, such as structured interfaces, prompts, and assignment of students to scripted roles (Fischer, 2013, 2014). To address this, Rose, et al. (2015a) argues for the use of tools like Accountable Talk, TagHelper, and LightSIDE to create communities of inquiry (Wenger, McDermott, & Snyder, 2002) and also monitor the progress of individual learners and address their needs (Pilling-Cormick & Garrison, 2007). Automated, dynamic, interactive, context-sensitive support could detect non-constructive content or encourage positive behavior (Kumar et al., 2007; Adamson et al., 2014). Automated analyses of student behavior in MOOCs could trigger personalized recommender mentor agents that provide opportunity suggestions to individual students as a side bar, based on the needs and interests of students. Trigger events could cause emails to be delivered to facilitators or instructors about discussions that need attention. Forum participation could be individualized through a computer-generated personalized recommendation that would draw attention to opportunities for engagement of interest to each individual student.

Chang, Hung & Lin (2015) used the Index of Learning Styles questionnaire, which measures active-reflective, sensing-intuitive, verbal, and sequential-visual global learning styles, (Felder & Soloman, 2001) to study the influence of learning styles on learners' intentions to use MOOCs. Their study compared students' learning styles, as determined by the ILS questionnaire, with their experiences with MOOCS and with educational technology in general. They found that learners with a high-reflective learning style had less experience with MOOCs; and students with less interest in using technology or those with low reflective learning styles needed clear instructions, group study options, and discussion options.

Although MOOC course participants represent a geographically, culturally and academically diverse group (Kop, 2011; Gillani et al., 2014b), Rolfe (2015) points out a lack of socio-ethnic addressing in MOOCs, noting that most MOOCS contain Western-oriented content and do not meet the requirements of diverse learners. Given the international makeup of many MOOC course participants, Zheng et al. (2015) write that it is important to know more about how people from various cultures prefer to communicate with each other in a MOOC and about the value of groups formed by MOOC instructors. In particular, these researchers were interested in finding out if grouping learners according to their stated preferences would impact their performance in, or completion of, a MOOC course. A pre-course online survey was administered to learners registered for a MOOC to determine their preferences for different types of online communication with group members—asynchronous text posts, synchronous text chats, or synchronous video and audio.

Another factor is the role of peers in multicultural online environments, as explored by (Sadykova, 2014), who found that close relationships with peers are essential to students from diverse native academic backgrounds and cultures. Peers serve as mediators of knowledge for international students, by compensating for the lack of culture-specific knowledge and skills and to satisfy their interest in the host culture.

2.2. Motivation and Engagement in Learning

The second group of factors that impact MOOC learners includes learners' motivation for taking a MOOC course and engagement in learning in a MOOC environment. Hew & Cheung (2014) found that students enroll in MOOCs to extend their knowledge in an area, out of curiosity about MOOCs, the desire for a personal challenge, and for the acquisition of qualifications, as in a certificate or course grade. To accommodate learner motivations in taking MOOCs, to-do lists could be automatically generated by the MOOC (Cheng et al., 2008), individual dashboards could present data to help learners understand what they need to do (Bienkowski, Feng, & Means, 2012), and information about different tracks could be available to accommodate learner motivations such as social, career, and education (Zheng et al., 2015; Wintrup et al., 2015).

On the other hand, as described in an earlier section of this paper, the completion rate for MOOC courses is very low (10%). A great deal of research has focused on student attrition (Wen, Yang & Rose, 2014a; Wen, Yang & Rose, 2014b; Yang et al., 2014; Barak, Watted, & Haick, 2016). Yang et al. (2014) and (Hew & Cheung, 2014) identified factors that contribute to learner dropout, such as ability and skills, and or/or external pressures like life events, low incentive to complete, and difficulty in understanding course content/ lack of support to address them. These factors underscore the importance of considering the relationship between feedback, performance, and dropout, and of taking into account how to support learners in the increased burden of time commitment they experience. Yang et al. (2014) used a computational model to trace user interaction in MOOCs, and compared it with qualitative feedback from learners, finding that students are vulnerable to dropping out when they don't perceive a connection between their interests/goals and the content in the course. Yang et al. suggested that forum mentors guide students to find connections or that real-time analysis of text alert mentors when a learner expresses doubt about progress, course material (Kumar & Rose, 2011; Adamson et al., 2014).

Kiizilcec & Schneider (2015) compared the expressed motivations of learners with their behavior in forums and presented a number of ideas for supporting social engagement: allowing learners to self-identify as a group, asking each learner to specify his/her goals for the course in terms of progress through materials, the creation of a group dashboard with which learners could hold each other accountable, and the inclusion of guidance for offline activities related to course content. Another idea is to create a social environment outside the course in which interested MOOC participants can discuss and share experiences. Within the course, group video chats (Kulkarni et al., 2015) and searchable learner profiles can help learners find others with similar interests, and a Q&A area can answer questions. Synchronous discussions can be embedded in lectures to engage students in discussion in small groups (Lim et al., 2014). Collaborations can be scripted by assigning a role to each person, or a

script can be followed for completing a project (Fischer, 2013, 2014). Kilzilcec & Schneider (2015) also suggest the modularization of course content to promote accessibility, clarify content organization, and archive information to facilitate learners' engagement in self-study. Content can be broken into separately tagged modules to allow reference-style usage as well as the remixing and sharing of pieces of the MOOC (Bruff et al., 2013). Another idea is to make two separate versions of the content-one for current learners, and another archived version for other learners, so that content becomes available to a wider audience of users.

2.3. Context of Time/Location/Modality

Ramsay & Terras (2015) point out the increasingly mobile landscape of learning, in which students can engage in learning with software systems that are integrated into cell phones and social media. While more and more learners are digitally savvy and interfaces are now user-friendly, MOOC learners still need to learn particular skills associated with online learning. Identification of these skills must be based on an examination of psycho-social aspects of learner behavior in a mobile technology, multi-contextual learning environment.

The online anytime/anywhere options for learning in MOOCs present challenges to learners regarding the effective management of study time, as well as interaction with both the technology built into the MOOC and the context of their engagement with co-learners and with other people outside the MOOC (Barbera, 2013; Terras & Ramsay, 2014a). Velestiano, Collier & Schneider (2015) found that MOOC learners reported learning on the MOOC while their children are asleep, during breaks at work, late at night, and whenever and wherever they got the chance, using using videos, transcripts of videos, social media, and informal interactions with others. MOOC alumnus developed connections with other learners on the MOOC that led to long-term relationships and interaction outside of the MOOC setting. Learners emailed each other and communicated via social media about posts in the forum to discuss course material and what they were learning on the MOOC with family and friends. Furthermore, learners took notes, on paper and digitally, shared their notes with others in the MOOC course as well as people outside the MOOC, and saved and used their notes at a later time. Velestsiano Collier & Schneider (2015) describe learners' use of MOOC course material and integrating it into their everyday lives as "a digital-analog and social-individual continuum" (580), emphasizing how the interaction between socialization and MOOC learning is an important part of educating the total person. Velestiano, Collier, & Schneider (2015) suggest that MOOC designers remind learners of the value of integrating their learning into their wider social network; offer support for offline social learning activities by making discussion guides available and practice activities for use on other platforms; embed into a MOOC course a social environment dashboard outside the course where learners can meet, discuss, and share experiences (Kilzilcec & Schneider, 2015); and support interoperability among course platforms and platform-social media interoperability (Ferschke et al., 2015), that, for instance, would enable social media plug-ins to send friends notices that people in their social network are registering for a MOOC (Veletsiano, Collier, & Schneider, 2015). Researchers also suggest integrating notetaking and reflective journal tools in MOOC platforms; scaffolding the notetaking process with templates from instructors about the type of information students need to record, graphic organizers, self-explanation of concepts, concept maps (Okada, Buckingham, & Sherborne, 2008); facilitating collaborative writing of notes and sharing to integrate collective knowledge and interests of a group (Kam et al, 2005; Shirouzu & Miyake, 2010; Steimle et al., 2010); and connecting notes to a moment in a video or assessment (Schneider & Kizilcec, 2014). Veletsianos, Collier, & Schneider (2015) also suggest giving learners ownership over the notetaking process and their notes, for use later on or for distribution to others; storing notes outside of a single course so learners can use them for multiple related courses; and basing notes on an interoperable protocol that can be used across multiple platforms, and are exportable in multiple formats for easy sharing and retrieval.

2.3.1. Time and Space Dimensions

As described above, today's learners themselves determine where, when, and how they will learn. This flexibility in itself can create challenges for learners, due to two aspects of memory identified by psychological researchers. First, memory is context-dependent (Godden & Baddeley, 1975; Woike, Bender & Besner, 2009), in that the context in which a memory is created enhances the chances of recalling that memory at a later time. For example, if a learner begins studying content on a website in the library and then in the course of the day switches to a textbook or other source in another setting, each change in the learning context makes context-related retrieval cues less effective in retrieving memories. Second, memory is also state-dependent, which means that it is easier to recall a memory when one is in the same state of mind (emotional, motivational, or physiological) in which the memory was encoded. Lum & Conti-Ramsden (2013) encourage teachers to raise leaners' awareness of these aspects of memory and develop memory strategies that can help overcome the lack of context-based cues. Memory skills vary with each individual, making it important to allow personalization of the learning process to accommodate a diversity of skills and behaviors.

2.3.2. Multitasking and Information Load

The multi-functional nature of the technology with which online learners engage in learning activities enables them to multitask, including checking on other, often unrelated media platforms as they learn. Ramsay & Terras (2015) write, "…the learner can now be in word processing mode (writing an essay) whilst simultaneously being in communication mode (taking part in an interactive group learning session via IM or Skype): that is, multitasking" (377). However, research has pointed to difficulties learners encounter as they spread their attention across multiple tasks. Davenport & Vödpel (2001) discuss the pressure which the amount or load of information made available by new technologies is increasingly placing on human attentional capacities, an issue first discussed by Sweller (1988). Becker, Alzahabi, & Hopwood (2013) write that since 2005, there has been a 20% increase in media use, that American youth have shown a 120% increase in media multitasking, and that the impact on learning is significant. Calderwood, Ackerwood, & Conclin et al. (2014) found that during a three-hour period, students who had access to multimedia listened to music and were distracted more than 30 times. Sanbonmatsu et al. (2013) studied actual vs. perceived multi-tasking, finding that people tend to overestimate their multitasking skills, and that those who are less skilled at multitasking tend to engage in it more. These results point to the fact that multitasking appears to present opportunities for easily distracted learners to escape the long periods of concentration on a single task that are necessary for learning (Calderwood, Ackerwood, & Conclin, 2014). As described in the following section, in such a potentially distraction-filled environment, a learner's metacognition and self-regulation are extremely important (Carr, 2011a, 2011b, 2013; Terras & Ramsay, 2012).

2.3.3. Metacognition and Self-Regulation

Metacognition is the learner's awareness of behaviors and decisions that impact on the learning process, as well as understanding of the temporal context of learning, both physical time (objective measures of linear times measured by seconds, hours, etc.) and psychological time (non-linear, context-dependent (Zakay, 2012; Hu & Zhuang, 2011). Ramsay & Terras (2015), Agostinho et al. (2013), and Roodenrye et al. (2012) emphasize the importance of building online learners' metacognitive ability, so they can self-regulate in various learning contexts.

Self-regulation is the way learners manage their learning by actively setting goals, planning to achieve them, identifying and using resources, monitoring their progress, and using self-corrective measures (Pintrich, 2000; Zimmerman, 2008). Self-regulation is particularly crucial for MOOC learners, given the lack of structure and teacher presence in many MOOCs.

Beaven et al. (2014) have identified self-determination and participatory literacy skills as key to effective learning via MOOCs. MOOC organizers should design learning, participation, and facilitation modes that match participants' capabilities; and learners should make effective use of their own self-determination and participatory literacy skills (Beaven et al. 2014).

Psycho-social and cognitive factors like metacognition, self-regulation, and motivation influence digital literacy and elearning

skills (Terras & Ramsay, 2015; Bonk & Khoo, 2014). These factors vary from individual to individual and can impact engagement with content creation, motivations for use, and online identity. Measuring and accounting for individual differences and supporting learners accordingly could improve learning experiences and the accessibility of open online learning environments (Garrison, 1997). In particular, MOOC learners need to be aware of how information like feedback and collaboratively written documents can change over time, the importance of self-monitoring of study time and planning for the future, and the constraints of the limited attentional and working memory capacities.

Ramsay & Terras (2015) underscore the importance of addressing three realities of 21st learning—learning is interactive, learners are connected around the clock through the Internet, and users can now create and share their own content. Given these assumptions, support is needed to build learner awareness of spatiotemporal changes of self and others. They suggest using interruption managers such as within-application icons or earcons that indicate how busy a learner is and his/her state of mind. Learners need to understand that the needs, habits, and behaviors of other online users may be different from their own, and that it cannot be assumed that other online users are always interruptible and available (Terras & Ramsay, 2012, 2014a, 2014b, 2015). Furthermore, other online users can have different personalities, personal preferences, local arrangements, physical context, time constraints, and demands on them.

3. Conclusions

This research has focused on answering three questions about psychosocial aspects of learning in MOOC courses. The following paragraphs highlight what research has discovered about each of these questions. Table 1 summarizes suggestions for addressing these issues. Which skill sets and preferences/learning styles of individual MOOC users impact on their success in this learning setting, and what are the implications for MOOC designers and instructors? Although many MOOC participants have digital savvy, this expertise does not necessarily transfer to a collaborative learning environment like MOOCs. The above discussion has revealed the crucial role of participation in learners' engagement and success and the need for guidance and support for participation to be built into MOOC design. Given the international makeup of many MOOC course participants, it is important to know more about how people from various cultures prefer to communicate with each other in a MOOC. Relationships with peers are essential to students from diverse native academic backgrounds and cultures, as peers serve as mediators of knowledge by compensating for the lack of culture-specific knowledge and skills and to satisfy their interest in the host culture.

Table 1. Addressing Psycho-Social Aspects of Learner Behavior in MOOCs.

Skills/Preferences/ Learning Styles	Motivation/Engagement	Time/Location/ Modality
Provide relevant group tasks (Brindley, Walti & Blaschke., 2009	To-do lists and dashboards (Bienkowski, Feng & Means, 2012; Kizilcec & Schneider, 2015; Cheng et al., 2008)	Reminders to integrate learning into wider social networks (Velestiano, Collier, & Schneider (2015)
Develop learners' planning and negotiation skills (Curtis & Lawson, 2001);	Information to learners about various MOOC tracks (Zheng et al., 2015; Wintrup et al., 2015).	Support for offline social learning activities (Kilzilcec & Schneider, 2015)
Support learners in acquiring the IT literacy skills required (Chapman, Ramondt, & Smiley, 2005)	Real-time text analysis (Kumar & Rose, 2011; Adamson et al., 2014)	Interoperability among course platforms and social media (Ferschke et al., 2015).
Ice breakers and statements about participation expectations (Chapman, Ramondt, & Smiley, 2005)	Allow learners to self-identify as a group, specify goals for the course (Kiizilcec & Schneider, 2015)	Notetaking, reflective journal tools (Okada, Buckingham, & Sherborne, 2008; Kam et al, 2005; Shirouzu & Miyake, 2010; Steimle et al., 2010)

Incentivize peer learning (Coetzee et al., 2015; Fischer, 2013, 2014)	Social environment outside the course where learners can discuss (Kulkarni et al., 2015)	Connection of notes to a moment in a video or assessment (Schneider & Kizilcec, 2014)
Map of participants' locations, learning-driven and certificate-driven modules (Zheng et al. 2015; Wintrup et al., 2015)	Searchable learner profiles; a Q&A area; synchronous discussions embedded in lectures (Lim et al., 2014)	Storage of online notes outside the course; use across multiple platforms (Veletsianos, Collier, & Schneider, 2015)
Discussion facilitation software (Kulkarni et al., 2015; Pilling-Cormick & Garrison, 2007; Rose & Ferschke, 2016); automated, context-sensitive text analysis (Kumar et al., 2007; Adamson et al., 2014)	Collaboration scripting that assigns roles to participants (Fischer, 2013, 2014)	Build learner awareness of spatiotemporal changes of self and others; icons or earcons to indicate physical location (Terras, Ramsay, & Boyle, 2015)
Learning style questionnaires (Felder & Soloman, 2001); facilitation of relationships for international students (Sadykova, 2014)	Content broken into separately tagged modules (Kilzilcec & Schneider, 2015; Bruff et al., 2013)	Help learners understand and consider the needs, habits, and behaviors of other online users (Terras & Ramsay, 2012, 2014a)

How do a MOOC learner's motivation in taking the course and level of engagement in the course impact learning in the MOOC? What can MOOC designers and instructors do to maximize motivation and engagement in a MOOC? This research has shown that students enroll in MOOCs to extend their knowledge in an area, out of curiosity about MOOCSs, the desire for a personal challenge, and for the acquisition of qualifications, such as a certificate or course grade. However, the completion rate for MOOC courses is an average of 10%; and is caused by internal factors like ability and skills; and/or external pressures like life events, poor incentives to complete, difficulties in understanding content, and lack of support to address these difficulties. Active participation in group collaboration that gives learners a sense of belonging and understanding of how the MOOC course can help them achieve their goals is crucial in establishing and maintaining learner engagement.

How does the context of a MOOC learner's learning experience vary in terms of time/location/modality--both inside and outside the MOOC? What can MOOC designers and instructors do to maximize learning in various contexts? MOOC design must be based on an examination of psycho-social aspects of learner behavior in a fast-evolving mobile technology, multi-contextual learning environment. Today's learners themselves determine where, when, and how they will learn. Changes in learning context, modality, and state of mind can disrupt memory recall. Instructors should raise leaners' awareness of these aspects of memory and develop memory strategies that can help overcome the lack of context-based cues. Research has pointed to difficulties learners encounter as they spread their attention across multiple tasks and often overestimate their ability to multitask as they learn. In such a potentially distraction-filled environment, a learner's metacognition and self-regulation are extremely important. Metacognition enables a student to self-regulate their learning by actively setting goals, planning to achieve them, identifying and using resources, monitoring progress, and using self-corrective measures. The lack of structure and teacher presence in many MOOCs makes self-regulation a crucial element in successful learning. However, learners also need to understand that the needs, habits, and behaviors of other online users may be different from our own, and that it cannot be assumed that they are always available and receptive to being interrupted.

4. Future Research Directions

Although admittedly not comprehensive, this research has highlighted many issues related to learning in MOOC courses that are in need of further study and enhancement, if the MOOC concept is to continue to be a viable alternative to face-to-face and traditional online courses. In order to reach its potential, more in-depth analysis is required of the nature of the MOOC learning environment and of the individual talents, needs, and perspectives of MOOC learners. A number of MOOC researchers have proposed and are pursuing answers to many questions about psycho-social aspects of learning in a MOOC environment. Terras

& Ramsay (2015) call for research into how cognitive activities like working memory capacity and inhibition impact can be supported as learners engage in MOOCs; the potential for MOOC environments to enhance digital skills and how this can be supported; psychological challenges that impact online learning; how the cognitive and psychological profile of MOOC learners differs; how metacognition skills can be built and supported in MOOC learners; how to raise MOOC learners' awareness of context-dependent aspects of memory; and how to help MOOC learners understand how online learning is distributed —over time, space, and in the minds of others. In addition to intention, individual learner levels of prior knowledge (Kalyuga, 2006), cognitive ability, preference, and style need to be studied (Mayer & Massa, 2003), as well as the extent to which learners in open learning environments are self-directed and have the metacognitive skills to choose activities that will help achieve their individual goals (Garrison, 1997); and the extent to which design changes for open online courses could support learners with specific motivations.

Veletsianos (2013), Gasevic et al. (2014), Adamson et al. (2014), Veletsianos, Collier, & Schneider (2015), Veletsianos & Shepherdson (2015), and Eynon et al. (2016) argue for more studies that use a variety of research methods—qualitative in addition to quantitative—and examine results from multiple perspectives--multidisciplinary, interdisciplinary, and cross-disciplinary. Veletsianos, Colllier, & Schneider (2015) suggest the need for further investigation of the relationship between social networks and MOOC participation, such as the impact of these relationships on learning course topics, the types of previous experiences in online navigation and communication which socially engaged students have, and how they develop support networks through social media.

Veletsianos (2013) proposes that insights into MOOC learner and instructor experiences, outcomes, practices, and interaction can be gained by considering the following: the learning outcomes of MOOCs, the types of learners who successfully complete MOOCs and what they have in common. For instance, does the strong positive relationship that has been noted between prior knowledge and learning (Dochy, Segers, & Buehl, 1999) apply to MOOC learners as well? Additionally, Veletsianos suggests the need for more insights into the nature of the learning experience in different types of MOOCs; and the factors that are necessary to sustain MOOC learners' interest, motivation, and participation.

Ramsay and Terras (2015) call for more research into types of training for online learning that take into account psycho-social aspects of learner behavior, in order to foster the development of metacognition skills that can guide learner behavior to achieve positive learning experiences. Rose and Ferschke (2016) discuss the fact that many early MOOCs were merely electronic versions of face-to-face courses that did not take into account the crucial element of interaction. These researchers suggest that MOOCs be seen as interactive textbooks that are used by communities of practice to engage in collaborative learning, and that insights from the fields of artificial intelligence in education and computer-supported collaborative learning can help shape the MOOCs of the future.

Rolfe (2015) argues that, since MOOCs are available to learners around the world, research is needed to address the needs of a geographically, culturally, and academically diverse participant group, as well as special needs students. Furthermore, it has been found that MOOC learners define their own learning paths, do not navigate content and assessment tasks in a linear fashion (Guo & Reinecke, 2014), and sometimes still access and participate in MOOC discussions after achieving their aims in a course (Liyanagunawardan & Williams, 2014). How can these learners be supported? Onah et al. (2014) propose investigation of the usefulness of the course aspect of MOOCs, suggesting that timetables for completion and/or collaboration do not fit into the busy schedules of many participants, who need more flexibility, in order to achieve their learning goals.

References

Adamson, D., Dyke, G., Jang, H. J., & Rose, C. P. (2014). Towards an agile approach to adapting dynamic collaboration support to student needs. *International Journal of AI in Education* 24(1), 91-121.

Agostinho, S., Bennett, S., Lockyer, L., Jones, J., & Harper, B. (2013). Learning designs as a stimulus and support for teachers'

design practices. In H. Beetham & R. Sharpe (Eds.), Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning, New York: Routledge, 119-132.

Bali, M. (2013). 5 reasons teachers should dip into moocs for professional development. MOOC News & Reviews.

Bali, M. (2014). Why doesn't this feel empowering? the challenges of web-based intercultural dialogue. *Teaching in Higher Education*, 19(2), 208-215.

Barak, M., Watted, A., & Haick, H. (2016) Motivation to learn in massive open online courses: examining aspects of language and social engagement. *Computers & Education*, 94, 49-60.

Barbera, E. (Ed.). (2013). Assessment and evaluation of time factors in online teaching and learning. Hershey, PA, IGI Global.

Bates, A.W. (2015) Teaching in a Digital Age: Guidelines for Designing Teaching and Learning Vancouver BC: Tony Bates Associates, Ltd.

Bayne, S., & Ross, J. (2011). "Digital native" and "digital immigrant" discourses: a critique. In R. Land & S. Bayne (Eds.), Digital Difference: Perspectives on Online Learning, Rotterdam, The Netherlands: Sense, 159-169.

Beaven, T., Hauck, M., Comos-Quinn, A., Lewis, T., & de los Arcos, B. (2014) MOOCs: striking the right balance between facilitation and self-determination. *MERLOT Journal of Online Learning and Teaching*, 10(1), 31-43.

Becker M.W., Alzahabi, R., & Hopwood, C.J. (2013) Media multitasking is associated with symptoms of depression and social anxiety. *Cyberpsychology, Behavior and Social Networking*, 16,132–135.

Bennett, S. J., Maton, K. A., & Kervin, L. K. (2008). The 'digital natives' debate: a critical review of the evidence. *British Journal of Educational Technology*, 39 (5), 775-786.

Berry, D. & Mok, L. (2018) Develop the competencies your workforce needs for the digital ecosystem. Gartner.com, Refreshed: 05 December 2018 | Published: 21 July 2017, G00325930.

https://www.gartner.com/doc/3767836/develop-competencies-workforce-needs-digital

Bienkowski, M., Feng, M., & Means, B. (2012). Enhancing teaching and learning through educational data mining and learning analytics: an issue brief. *US Department of Education, Office of Educational Technology*, 1-57.

Bika, N. (2017). 13 collaboration tools for productive teams. workable. https://resources.workable.com/tutorial/collaboration-tools. Accessed on February 27, 2017.

Bonk, C. J., & Khoo, E. (2014) Adding Some TEC-VARIETY: 100+ Activities for Motivating and Retaining Learners Online. Bloomington, IN: Open World Books.

Breslow, L., Pritchard, D., DeBoer, J., Stump, G. Ho, A.D., & Seaton, D.T. (2013) Studying learning in the worldwide classroom: research into edx's first mooc. *Research and Practice in Assessment*, 8(1), 13-25.

Brindley, J. Walti, C., & Blaschke, L. (2009). Creating effective collaborative learning groups in an online environment. *International Review of Research in Open and Distance Learning*, 10 (3).

Brinton, C.G., Chiang, M. Jain, S., Lam, H. Liu, Z., & Wong, F. (2014). Learning about social learning in moocs: from statistical analysis to generative model. *IEEE TRANSACTIONS ON LEARNING TECHNOLOGIES*, 7 (4), 346-359.

Bruff, D. O., Fisher, D. H., McEwen, K. E., & Smith, B. E. (2013). Wrapping a mooc: student perceptions of an experiment in blended learning. *Journal of Online Learning and Teaching*, 9 (2), 187-199.

Calderwood, C., Ackerman, P. L., & Conklin, E. M. (2014). What else do college students ''do'' while studying? an investigation of multitasking. *Computers & Education*, 75, 19-29.

Carr D. F. (2011a). AnyMeeting offers free (ad-supported) web meetings. Forbes. Retrieved from http://www.forbes.com/sites/davidcarr/2011/04/26/anymeeting-offers-free-ad-supported-web-meetings/.

Carr. N.G. (2011b) The Shallows: How the Internet is Changing the Way We Think, Read and Remember. London: Atlantic Books.

Carr, D. F. (2013) MOOC profs supplement coursera discussions with town hall. Information Week, July 3. http://www.informationweek.com/software/mooc-profs-supplement-coursera-discussions-with-town-hall/d/d-id/1110639?&#msgs

Centre for Learning and Performance Technologies, 2017. http://c4lpt.co.uk/

Chafkin, M. (2013). Udacity's sebastian thrun, godfather of free online education, changes course. Fast Company. Retrieved from http://www.fastcompany.com/3021473/udacity-sebastian-thrun-uphillclimb

Chan, R. Y. Y., Huang, J., Hui, D., Li, S., & Yu, P. (2013). Gender differences in collaborative learning over online social networks: epistemological beliefs and behaviors. *Knowledge Management & E-Learning*, 5(3), 234-250.

Chan, C. K. K. (2013). Collaborative knowledge building: towards a knowledge creation perspective. In C. E. Hmelo-Silver, C. A. Chinn, C. K. K. Chan & A. M. O'Donnell (Eds.), International Handbook of Collaborative Learning, New York: Taylor and Francis, 437-461.

Chang, R. I., Hung, Y. H., & Lin, C. F. (2015). Survey of learning experiences and influence of learning style preferences on user intentions regarding moocs. *British Journal of Educational Technology*, 46(3), 528-541.

Chapman, C., Ramondt, L., & Smiley, G. (2005). Strong community, deep learning: exploring the link. *Innovations in Education and Teaching International*, 47(3), 217-230.

Cheng, Z. et al. (2008) Instructional media design based on cognitive load theory. *Modern Educational Technology*, 11, 50-52.

Chinn, C. A., & Clark, D. B. (2013). Learning through collaborative argumentation. In C. Hmelo-Silver, C. A. Chinn, C. K. K. Chan & A. M. O'Donnell (Eds.), The International Handbook of Collaborative Learning, New York: Routledge, 314-332.

Coetzee, D, Lim, S., Fox, A., Hartmann, B. & Hearst, M. (2015). Structuring interactions for large-scale synchronous peer learning. CSCW '15: Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing. UC Berkeley: Center for Information Technology Research in the Interest of Society (CITRIS).

Curtis, D. D., & Lawson, M. J. (2001). Exploring collaborative online learning. *Journal of Asynchronous Learning Network*, 5(1), 21-34.

Davenport, T., & Völpel, S.C. (2001) The rise of knowledge towards attention management. *Journal of Knowledge Management*, 5(3), 212-222.

Dochy, F., Segers, M., & Buehl, M. (1999). The relation between assessment practices and outcomes of studies: the case of research on prior knowledge. *Review of Educational Research*, 69, (2), 145-186.

Downes, S. (2006). Learning networks and connective knowledge. In H. H. Yang & S. Chi-Yin Yuen (Eds.), Collective Intelligence and E-Learning 2.0: Implications of Web-Based Communities and Networking, Hershey, PA: IGI Global.

Eynon, R., Hjoth, I., Yasseri, T., & Gillani, N. (2016), Understanding communication patterns in moocs: combining data mining and qualitative methods, In S. El Atia, D. Ipperciel, and O. Zaïane (Eds.), Data Mining and Learning Analytics: Applications in Educational Research, Hoboken, NJ: Wiley Books.

Felder, R.M., & Soloman, B.A. (2001) Index of Learning Styles Questionnaire, North Carolina State University. Online at: http://www2.ncsu.edu/unity/lockers/users/f/felder/public/ILSdir/ILS-a.htm

Ferschke, O., Howley, I., Tomar, G., Yang, D., & Rose, C.P (2015) Fostering discussion across communication media in massive open online courses. Proceedings of the 11th, International Conference on Computer Supported Collaborative Learning, Gothenburg, Sweden, 459-466.

Firmin, R., Schiorring, E., Whitmer, J., Willett, T., Collins, E. D., & Sujitparapitaya, S. (2014). Case study: using moocs for conventional college coursework. *Distance Education*, 35 (2), 178-201.

Fischer, G. (2013) A conceptual framework for computer-supported collaborative learning at work in S. Goggins, I. Jahnke, & V. Wulf (Eds.), Computer-Supported Collaborative Learning at the Workplace (CSCL@Work,) Heidelberg: Springer, 23-42.

Fischer, G. (2014) Supporting self-directed learning with cultures of participation in collaborative learning environments. In E. Christiansen, L. Kuure, A. Mørch, & B. Lindström (Eds.), Problem-Based Learning for the 21st Century - New Practices and Learning Environments, Aalborg University Press, 15-50.

Garrison, D.R. (1997) Self-directed learning: toward a comprehensive model. *Adult Education Quarterly*, 48(1), 18-33.

Gasevic, D., Kovanovic, V., Joksimovic, S., & Siemens, G. (2014). Where is research on massive open online courses headed? A data analysis of the mooc research initiative. *The International Review of Research in Open and Distributed Learning*, 15 (5).

Gillani, N., & Eynon, R. (2014) Communication patterns in massively open online courses. *The Internet and Higher Education*, 23, 18-26.

Gillani, N., Yasserie, T., Eynon, R., & Hjorth, I. (2014a). Structural limitations of learning in a crowd: communication vulnerability and information diffusion in moocs. *Scientific Insights*, 4, 64-47.

Gillani, N., Eynon, R., Osborne, M., Hjorth, I., & Roberts, S. (2014b). Communication Communities in MOOCs.

Godden, D. R., & Baddeley, A. D. (1975). Context-dependent memory in two natural environments: on land and underwater. *British Journal of Psychology*, 66(3), 325-331.

Guo, P. J., & Reinecke, K. (2014). Demographic differences in how students navigate through moocs. Proceedings of the first ACM conference on Learning@ Scale Conference, 21-30.

Harasim, L. (2012) Learning Theory and Online Technologies. New York, N.Y.: Routledge Press.

Hew, K. F., & Cheung, W. S. (2014). Students' and instructors' use of massive open online courses (moocs): motivations and challenges. *Educational Research Review*, 12, 45-58.

Hone, K., & El Said, G. R. (2016) Exploring the factors affecting mooc retention: a survey study. *Computers & Education*, 98, 157-168.

Hu L and Zhuang S (2011) Cultivating metacognitive strategies in m-learning with e-materials of college English. Advances in computer science, environment, ecoinformatics and education. Part III international conference, Wuhan, China, 216, pp.587–591. CSEE

Hu L and Zhuang S (2011) Cultivating metacognitive strategies in m-learning with e-materials of college English. Advances in computer science, environment, ecoinformatics and education. Part III international conference, Wuhan, China, 216, pp.587–591. CSEE

Hu, L, & Zhuang, S, (2011) Cultivating metacognitive strategies in m-learning with e-materials of

college english. advances in computer science, environment, ecoinformatics and education. Part III International Conference, Wuhan, China, 587–591.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (1998) Active Learning: Cooperation in the College Classroom, (2nd ed.), Edina, MN: Interaction Books.

Joksimovic, S., Kovanovic, V., Jovanovic, J., Zouaq, A., Gasevic, D., & Hatala, M. (2015). What do cmooc participants talk about in social media? a topic analysis of discourse in a cmooc. Proceedings of the Fifth International Conference on Learning Analytics and Knowledge (LAK15), Poughkeepsie, NY, March 16-20, 2015,156-165.

Kalyuga, S. (2006). Assessment of learners' organised knowledge structures in adaptive learning environments. *Applied Cognitive Psychology*, 20, 333-342.

Kam, W., Wang, J., Iles, A., Tse, E., & Chiu, J. (2005) Lifenotes: a system for cooperative and augmented note-taking in lectures. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 531-540.

Kamel Boulos, M. N., & Wheeler, S. (2007), The emerging web 2.0 social software: an enabling suite of sociable technologies in health and health care education. *Health Information & Libraries Journal*, 24, 2-23, 1471-1842.

Kellogg S., Booth, S., & Oliver K. (2014). A social network perspective on peer supported learning in moocs for educators. *The International Review of Research in Open and Distance Learning*, 15 (5), 263-289.

Kizilcec, R., Piece, C., & Schneider, E. (2013). Deconstructing disengagement: analyzing learner subpopulations in massive open online courses. The 3rd Proceedings of the Learning Analytics and Knowledge Conference. Belgium: Leuven.

Kizilcec, R.F., & Schneider, E. 2015. Motivation as a lens to understand online learners: toward data-driven design with the olei scale. ACM Trans. *Computer-Human Interaction*, 22 (2), Article 6.

Koller, D., Ng, A., Do, C., & Chen, Z. (2013). Retention and intention in massive open online courses: In depth. Educause Review, June 3.

Kop, R., Fournier, H., & Mak, S.F.J. (2011) A pedagogy of abundance or a pedagogy to support human beings? participant support on massive open online courses. International Review of Research in Open and Distance Learning, Special Issue - Emergent Learning, *Connections, Design for Learning*. 12 (7), 74-93.

Kop, R. (2011) The challenges to connectivist learning on open online networks: learning experiences during a massive open online course. The International Review of Research in Open and Distributed Learning, Special Issue - Connectivism: Design and Delivery of Social Networked Learning, 12 (3), 19-38.

Koutropoulos, A., Gallagher, M. S., Abajian, S. C., deWaard, I., Hogue, R. J., Keskin, N. Ö., & Rodriguez, C. O. (2012). Emotive vocabulary in moocs: context & participant retention. *European Journal of Open, Distance and E-Learning*, 15 (1).

Kulkarni, C., Cambre, J., Kotturi, Y., Bernstein, M., & Klemmer, S. (2015). Talkabout: making distance matter with small groups in massive classes. Proceedings of CSCW: ACM Conference on Computer Supported Collaborative Work, Vancouver,

Canada, March 14-18, 2015, 1116-1128.

Kumar, R., Rose, C. P., Wang, Y. C., Joshi, M., & Robinson, A. (2007). Tutorial dialogue as adaptive collaborative learning support. Proceedings of the 2007 Conference on Artificial Intelligence in Education: Building Technology Rich Learning Contexts That Work, 383-390.

Kumar, R., & Rose, C. P. (2011). Architecture for building conversational agents that support collaborative learning. *IEEE Transactions on Learning* 4(1), 21-34.

Lave, J., & Wenger, E. (1991). Situated Learning: Legitimate Peripheral Participation. Cambridge: Cambridge University Press.

Lim, S., Coetzee, D., Hartmann, B., Fox, A., & Hearst, M.A. (2014). Initial experiences with small group discussions in moocs. Works-in-Progress Session of the First ACM Symposium on Learning At Scale (L@S 2014), Atlanta, GA, March 4-5, 2014.

Liyanagunawardena, T.R., Adams, A.A., & Williams, S.A. (2013) MOOCs: a systematic study of the published literature 2008-2012. *International Review of Research in Open and Distance Learning*, 14 (3), 202-227.

Liyanagunawardena, T.R., & Williams, S.A. (2014) Massive open online courses on health and medicine. *Journal of Medical Internet Research*, 16 (8).

Lum, J. A. G., & Conti-Ramsden, G. (2013). Long-term memory: A review and meta-analysis of studies of declarative and procedural memory in specific language impairment. *Topics in Language Disorders*, 33(4), 282-297.

Mackness, J., Mak, S. F. J., & Williams, R. (2010). The ideals and reality of participating in a mooc. In L. Dirckinck-Holmfeld, V. Hodgson, C. Jones, M. de Laat, D. McConnell, & T. Ryberg. (Eds.), Proceedings of the Seventh International Conference on Networked Learning (266-275). Lancaster, UK: University of Lancaster.

Marcus, J. (2013). All hail moocs! just don't ask if they actually work. The Hechinger Report in Time online, September 12, 2013. Retrieved from http://www.time.com

Mayer, R. E., & Massa, L. (2003). Three facets of visual and verbal learners: cognitive ability, cognitive style, and learning preference. *Journal of Educational Psychology*, 95, 833-841.

Okada, A., Buckingham, S., & Sherborne, T. (Eds.) (2008). Knowledge cartography: software tools and mapping techniques. Advanced Information and Knowledge Processing, 1. London, UK: Springer.

Onah, D.F.O., Sinclair, J., & Boyatt, R. (2014) Dropout rates of massive open online courses: behavioral patterns. Proceedings of EDULEARN14, Spain, Barcelona, 5825-5834.

Palloff, R. M., & Pratt, K. (2005). Collaborating Online: Learning Together in Community. San Francisco, CA: Jossey-Bass.

Parr, C. (2013). Mooc completion rates 'below 7%'. The Times Higher Education, May 9, 2013.

Pegrum, M. (2009). From Blogs to Bombs: The Future of Digital Technologies in Education. Crawley, WA: UWA Publishing.

Pegrum, M. (2011) Modified, multiplied, and (re-)mixed: social media and digital literacy. In M. Thomas (Ed.) Digital Education: Opportunities for Social Collaboration. *Basingstoke: Palgrave Macmillan*, 9-35.

Perna, L.W., Ruby, A., Boruch, R. F., Wang, N., Scull, J., Ahmad, S., & Evans, C. (2014) Moving through moocs: understanding the progression of users in massive open online courses. *Educational Researcher*, 43 (9), 421–432.

Pilling-Cormick, J., & Garrison, D.R. (2007). Self-directed and self-regulated learning conceptual links. *Canadian Journal of University Continuing Education*, 33 (2), 13-33.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), Handbook of Self-Regulation, San Diego, CA: Academic, 451-502.

Pretz, K. (2014). Low completion rates for moocs. Retrieved from http://theinstitute.ieee.org/ieee-roundup/opinions/ieee-roundup/low-completion-rates-for-moocs

Ramsay, J., & Terras, M.M. (2015) The pendulum swing of user instruction and interaction: the resurrection of 'how to use' in the 21st century. *E-Learning and Digital Media*, 12 (3-4), 372-390.

Rolfe, V. (2015) A systematic review of the socio-ethical aspects of Massive Online Open Courses. *The European Journal of Open, Distance and e-Learning*, 18 (1), 53-72.

Roodenrye, K., Agostinho, S., Roodenrys, S., & Chandler, P. (2012). Managing one's own cognitive load when evidence of split attention is present. *Applied Cognitive Psychology*, 26, 878-886.

Rose, C. P., Goldman, P., Zoltners, S. J., & Resnick, L. (2015a) Supportive technologies for group discussion in moocs. Current Issues in Emerging eLearning, 2 (1), Article 5.

Rose, C. P., Ferschke, O., Tomar, G., Yang, D., Howley, I., Aleven, V., Siemens, G., Crosslin, M., Gasevic, D., & Baker, R. (2015b). Challenges and opportunities of dual-layer moocs: reflections from an edx deployment study. Proceedings of the 11th International Conference on Computer Supported Collaborative Learning—CSCL 2015 Gothenburg, Sweden: International Society of the Learning Sciences, 848–851.

Rose, C. P., & Ferschke, O. (2016). Technology support for discussion based learning: from computer supported collaborative learning to the future of massive open online courses. International Journal of AI in Education, 25th Anniversary Edition (2).

Ross, J., Sinclair, C., Knox, J., Bayne, N., & Macleod, H. (2014), Teacher experiences and academic identity: the missing components of mooc pedagogy. *Journal of Online Learning and Teaching*, 10 (1), 57.

Sadykova, G. (2014) Mediating knowledge through peer-to-peer interaction in a multicultural online learning environment: a case study of international students. *International Review of Research in Open and Distributed Learning*, 15 (3).

Sanbonmatsu, D.M., Strayer, D.L., Medeiros-Ward, N., & Watson J.M. (2013) Who multi-tasks and why? multi-tasking ability, perceived multi-tasking ability, impulsivity, and sensation seeking. *PLoS ONE*, 8(1).

Schneider, E., & Kizilcec, R. F. (2014). "Why did you enroll in this course?" developing a standardized survey question for reasons to enroll. Proceedings of the First ACM Conference on Learning at Scale, L@S'14, Atlanta, GA, March 4-5, 2014.

Shirouzu, H., & Miyake J. (2010). The jigsaw as an enhancer of collaborative knowledge integration. In S. Ohlsson & R. Catrambone (Eds.), Proceedings of the 32nd Annual Conference of the Cognitive Science Society.

Shrader, S., Wu, M., Owens, D., & Santa Ana, K. (2016). Massive open online courses (moocs): participant activity, demographics, and satisfaction. Online Learning, Special Issue: Learning Analytics, 20(2), 199-216.

Siemens, G. (2005). Connectivism: a learning theory for the digital age. *International Journal of Instructional Technology & Distance Learning*, January, 3-10.

Smith, B., & Eng, M. (2013). MOOCs: A learning journey. In S. K. S. Cheung, J. Fong, W. Fong, F. L. Wang, & L. F. Kwok (Eds.), Hybrid Learning and Continuing Education, Berlin: Springer, 244-255.

Steimle, J., Khalilbeigi, M., Muhlhauser, M., & Hollan, J.D. (2010) Physical and digital media usage patterns on interactive tabletop surfaces. Proceedings of the ITS 2010, ACM Press, 167-176.

Steinke, K. & Bryan, V.C. (2014) Adult learning in a digital age: Effective use of technologies for adult learners. In Victor X. Wang, Ed, Handbook of Research on Education and Technology in a Changing Society, IGI Global, 2014, 607-624.

Stewart, C. (2016) The 20 best tools for online collaboration. Creativebloque.com. http://www.creativebloq.com/design/online-collaboration-tools-912855

Sweller, J. (1988). Cognitive load during problem solving: effects on learning. *Cognitive Science*, 12(2), 257-285,

Terras, M. M., & Ramsay, J. (2012), The five central psychological challenges facing effective mobile learning. *British Journal of Educational Technology*, 43, 820–832.

Terras. M.M., & Ramsay, J. (2014a) Psychological perspective on the temporal dimensions of e-learning. E-Learning and Digital Media 11(2), Special Issue: The Temporal Dimensions of E-learning, 108–122.

Terras, M.M., & Ramsay, J. (2014b) E-learning, mobility, and time: a psychological framework. In B. Elena and R. Peter (Eds.), Assessment and Evaluation of Time Factors in Online Teaching and Learning. IGI Global, Hershey, PA, 63-90.

Terras, M.M., Ramsay, J., & Boyle, E.A. (2015) Digital media production and identity: insights from a psychological perspective. *E-Learning and Digital Media*, 12(2), 128-146.

Terras, M. M., & Ramsay, J. (2015), Massive open online courses (moocs): insights and challenges from a psychological perspective. *British Journal of Educational Technology*, 46, 472-487.

Terras, M.M., Ramsay, J, & Boyle, E.A. (2011) A psychological perspective on media literacy. In S.D. Grahame (Ed.) Science Education in a Rapidly Changing World. New York: Nova Science Publishers Inc., 63-90.

Veletsianos, G. (2013) The research moocs need. http://www.veletsianos.com/2013/06/05/the-research-that-moocs-need.

Veletsianos, G., Collier, A., & Schneider, E. (2015). Digging deeper into learners' experiences in moocs: participation in social networks outside of moocs, notetaking, and contexts surrounding content consumption. *British Journal of Educational Technology*, 46(3), 570-587.

Veletsianos, G., & Shepherdson, P. (2016). a systematic analysis and synthesis of the empirical mooc literature published in 2013–2015. *The International Review Of Research In Open And Distributed Learning*, 17(2).

Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Cambridge, MA: Harvard University Press.

Wen, M., Yang, D., & Rose, C.P. (2014a) Sentiment analysis in mooc discussion forums: what does it tell us? Proceedings of the 7th International Conference on Educational Data Mining, London, UK, July 4, 2014 - July 7.

Wen, M., Yang, D., & Rose, C. P. 2014b. Linguistic reflections of student engagement in massive open online courses. Proceedings of the International Conference on Weblogs and Social Media, Ann Arbor, Michigan, USA, June 1-4, 2014.

Wenger, E. McDermott, R., & Snyder, W. (2002) Cultivating communities of practice: a guide to managing knowledge. Cambridge, Mass: Harvard Business School Press.

Wintrup, J., Wakefield, K., Morris, D., & Davis, H. (2015), Liberating learning: experiences of moocs. The Higher Education Academy, York, United Kingdom.

Woike, B.A., Bender, M., & Besner, N. (2009) Implicit motivational states influence memory: evidence for incidental learning in personality. *Journal of Research in Personality*, 43, 39-48.

Yang. J. (2013) Mobile learning design principles under the perspective of cognitive load theory. *Modern Distance Education Research*, 3, 86-90.

Yang, D., Wen, M., Kumar, A., Xing, E., & Rose, C. P. (2014). Towards an integration of text and graph clustering methods as a lens for studying social interaction in moocs. The International Review of Research in Open and Distance Learning, 15 (5).

Zakay D. (2012). Experiencing time in daily life. *Journal of British Psychology*, 25, 578-582,

Zheng, S., Rosson, M.B., Shih, P., & Carroll, J. (2015). Understanding student motivation, behaviors, and perceptions in moocs. Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing, Vancouver, BC, Canada, March 14-18, 2015, 1882-1895.

Zimmerman. B.J. (2008) Methodological developments, and future prospects investigating self-regulation and motivation: historical background. *American Educational Research Journal*, 45 (1), 166-183.