LCM: A model for planning, designing and conducting Learner-Centric MOOCs

Sahana Murthy
Indian Institute of Technology Bombay
Mumbai, India
sahanamurthy@iitb.ac.in

Jayakrishnan Madathil Warriem
Indian Institute of Technology Madras
Chennai, India
mail.2.jkmadathil@gmail.com

Sameer Sahasrabudhe
Indian Institute of Technology Bombay
Mumbai, India
iamsameerss@gmail.com

Sridhar Iyer
Indian Institute of Technology Bombay
Mumbai, India
sri@iitb.ac.in

***Abstract* – MOOCs are expanding in popularity and scope, and several new courses are being designed and implemented in a variety of contexts. The discussion around MOOCs is growing too, however, much of that is centered around technological or certification-related issues. There are still not many advances in the pedagogical format, and many MOOCs end up being an online version of the traditional lecture format. At the same time, several problems have been reported, such as, lack of learner engagement, low participation in forums and low completion rates. To address these challenges, we present the *Learner-Centric MOOC* model: a prescriptive model consisting of a set of guidelines, activity formats and actions for MOOC creators. The LCM model guides instructors in conceptualizing, creating and conducting a MOOC, while maintaining a learner-centric pedagogical approach at its core. The LCM model consists of four structural elements: Learning Dialogs, Learning by Doing activities, Learning Experience Interaction and Learning Extension Trajectories, and Orchestration dynamics. In this paper, we describe the structural and dynamic aspects of the LCM model, show its application in various MOOCs and illustrate evaluation results from MOOCs based on LCM model.**

Keywords – learner-centric pedagogy, MOOC design, active learning, peer learning

I. Introduction

Massive Open Online Courses have been steadily expanding in popularity and scope in the past decade. There has been a growth in the number of learners, courses, MOOC providers, and MOOC-based credentials [1]. There is widespread discussion on a variety of issues related to MOOCs such as flexibility, convenience, certification, costs, and technology. However, relatively fewer debates exist on the pedagogical issues in this emergent educational setting.

MOOCs contain a few specific challenges which not only include large numbers but great diversity in learners' background, ages, experiences, and motivation for participating. Reported problems include lack of engagement by participants, scattered discussion forums [2] and low completion rates [3]. A criticism of many MOOCs is that they are not based on our current understanding of how people learn [4]. Instructors who are new to creating MOOCs tend to follow the pedagogical model of traditional classrooms, where the emphasis is transfer of information from the teacher to the learners. However, information transfer alone, without learner interaction is not effective, especially today, where learners have tremendous access to information from diverse sources. Learners need activities to help them assimilate the information, opportunities to apply their knowledge and get feedback, and settings to learn from each other [5]. A learner-centric approach is a broad pedagogical principle that is known to be effective for student engagement and learning in various settings.

In the light of these issues, we present the *Learner-Centric MOOC* (LCM) model, that guides MOOC instructors in conceptualizing, creating and conducting their course based on a learner-centric approach throughout the process. In this paper, we argue the rationale of adhering to a learner-centric approach in a MOOC context and describe pedagogical features in a learner-centric approach. We explain the details of the structural elements and the dynamic interactions in the LCM model that help an instructor incorporate a learner-centric approach in their course. We then give an overview of some MOOCs that we have designed and implemented based on this model, and show illustrative evaluation results.

II. Related Work

The importance of learner-centric approaches in online learning has been highlighted by researchers and practitioners who have been designing online courses for higher education and corporate training over the past few decades. [6,7]. Traditionally, many MOOCs have followed the xMOOCs pedagogical approach, which emphasizes information transfer via chunked video lectures, providing additional resources and automated testing. Yet there have been several efforts of designing and evaluating MOOCs that go beyond traditional lecture videos and quizzes. The pioneering MOOCs, i.e. the cMOOCs are based on a connectivist theories, and focus on learners' networks and community created knowledge [8].

More recently, a study showed the improved comprehension and retention of the learning content with embodied interactive learning activities in video lectures [9]. Another empirical study in a psychology MOOC showed the benefits of learning by doing activities, that is, students who did more interactive activities showed improved learning outcomes compared to students who watched more lecture videos or read more information [10]. Case studies comparing a set of MOOCs have attempted to analyze sound pedagogical practices and factors that promote learner engagement in MOOCs [11,12]. Key effective features include active learning, prompt feedback, peer interaction, resources addressing learners' diversity and enhanced

student-instructor contact. In terms of a learning design for MOOCs, a set of design principles was proposed based on the learners' perspective: empowering learners via self-regulation and guiding learners towards peer assistance and peer feedback [13].

III. The LCM Model

A. Theoretical background

A learner-centric approach places a learner or a group of learners at the centre of the construction of knowledge and has its roots in constructivist philosophies [14, 15]. The learning activities are designed from the perspective of the learner and address the needs, goals and interests of diverse learners. A widespread learner-centric approach in face-to-face classrooms is active learning, which comprises a host of activities such as discussion, debate, group problem solving, debates, simulations, role-play and so on [16]. An important aspect of learner-centric approach is the role played by social interaction: learning occurs as learners compare and share their ideas with others, build on knowledge of their peers and resolve conflicts [14, 15, 17]. Learner-centric approaches place a high value on formative assessment [18], where learners are given frequent opportunities to apply, practice and get constructive feedback to improve their learning.

B. Overview

The LCM model is a prescriptive model that guides an instructor in maintaining a learner-centric approach while planning, designing and conducting their MOOC. It provides a set of guidelines, activity formats and actions for various aspects of the MOOC. The LCM model consists of learner-centric structural elements: Learning Dialogs, Learning by Doing activities, Learning Experience Interactions and Learning Extension Trajectories (Fig. 1), and the dynamics of Orchestration. The guidelines in the LCM model help MOOC instructors create the above structural elements for their course and ensure that the associated dynamic interactions amongst learners, instructor, and content will be incorporated.

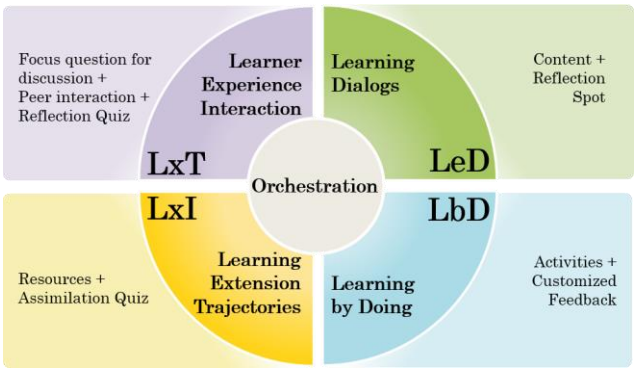

Fig. 1. LCM model overview

IV. Structural Elements and Dynamic Processes

A. Learning Dialogs (LeD)

An LeD promotes concept acquisition through learner interaction. Each LeD consists of a short video providing conceptual knowledge, with explicit spots for the learner to express prior conceptions, perform micro-practice or reflect. These spots are known as Reflection Spots, at which the instructor poses a question (such as an automated multiple choice question) or gives a brief activity (such as writing in their notebook). The learner is expected to pause the video and respond to the question or activity. Thus learners express their thinking and articulate their reasoning while interacting with LeDs. After the Reflection Spot the instructor addresses common expected responses and summarizes the concept in the rest of the video. Fig. 2 shows the structure and dynamics of a LeD.

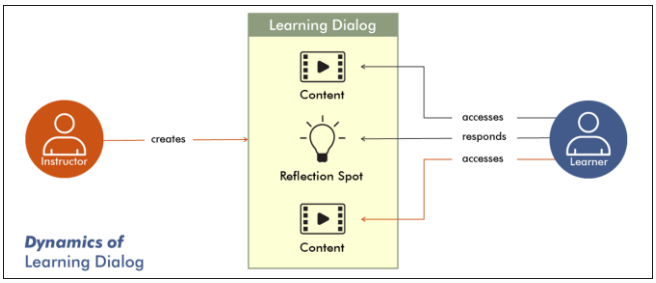

Fig. 2. Learning Dialogs

B. Learning by Doing activties (LbD)

LbDs are a formative assessment activities that provides learners with frequent and multiple opportunities to practice, apply their learning, and get feedback on their work (Fig. 3). LbDs help learners towards the goals of concept attainment, immediate application or integration of knowledge. LbD activities can be designed in various formats, depending on the affordances in the MOOC platform, for example, multiple choice questions with feedback, short answer questions, activities involving figures and drag & drop, or activities requiring longer responses via a textbox or file upload. Each LbD provides learners with constructive and customized feedback to help them revise and improve their learning. The feedback can be designed by the instructor and provided via the automated system response, or as self-assessment or given in a peer-review process using rubrics.

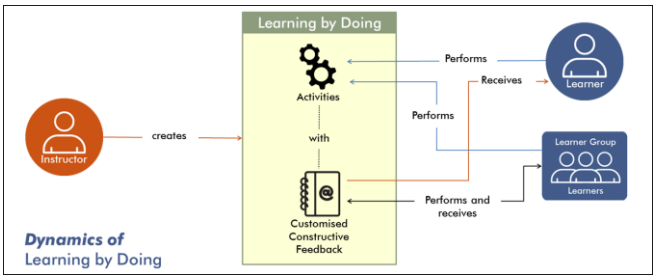

Fig. 3. Learning by Doing

C. Learning Experience Interaction (LxI)

An LxI cultivates peer learning through focused discussion. An LxI consists of a focus question that guides learners' discussion on a given topic, and hence avoids a common problem of scattered discussion threads in MOOCs. The goal of the focus question is to elicit diverse learner views or experiences, or share learner created artefacts. It requires the learners to interact with their peers by viewing and responding to others' posts, thus encouraging participation and leveraging peer learning. In an LxI, the focus question and subsequent discussion is followed by a short graded activity called the Reflection Quiz, in which learners reflect on the interaction by answering specific

questions related to their experience in the discussion forum. The focus question in the LxI prevents scattered discussion, and the Reflection Quiz ensures learner participation (Fig. 4).

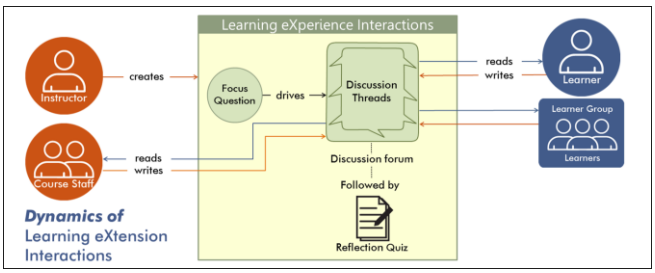

Fig. 4. Learning Experience Interaction

D. Learning Extension Trajectories (LxT)

LxTs are mechanisms to address the diversity of learners in a MOOC and their learning needs. LxTs consist of multiple types of resources followed by an 'Assimilation Quiz' that incentivizes learners to access these resources. Resources can include additional readings, videos, links and so on, with specific identified goals such as ensuring pre-requisites, advancing the depth or breadth of learners' existing knowledge, or supporting learners' language needs. The Assimilation Quiz is a short graded activity to ensure that learners assimilate the key concept from the resources for the intended goal. Fig. 5 shows the structure and dynamic interactions in LxTs.

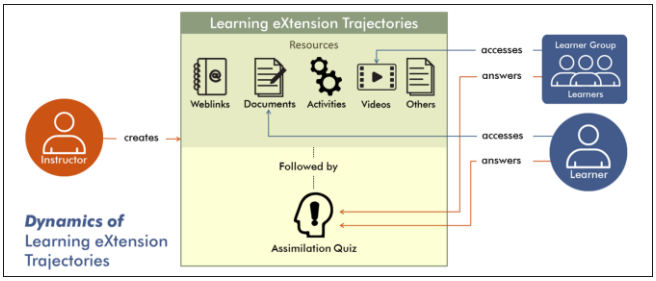

Fig. 5. Learning Extension Trajectories

E. Orchestration

To maintain a learner-centric approach in a MOOC, attention is needed not only during the design of the course content and activities, but also during the implementation of the course. Orchestration is the process in which the course instruction team assists and guides learners in the learning paths during the MOOC offering. This is especially important in an online setting as different learners will need different kinds of flexibility while accessing the course. To ensure that all learners persist in the course, instructors should plan for both social and teaching presence apart from the cognitive presence [19]. Orchestration will require the course team to setup course management protocols, utilize course analytics to gauge learner engagement and learning, and dynamically adapt the course content or format to maintain high levels of learner engagement and connect.

V. Application of the LCM Model

A. Implementation

The LCM model has been used as the basis to design and deploy a variety of MOOCs in different topics and for different categories of learners. Examples of MOOCs designed and implemented using the LCM model (offered on IITBombayX) are:

- *Educational technology for engineering teachers*. This 8-week MOOC was offered in 2016, and is a faculty professional development course for engineering college instructors.
- *Pedagogy for effective integration of ICT for school teachers.* This 6-week course was offered twice in 2017 and is currently being offered for a third time (as a 4-week course). It focuses on research-based learner-centric strategies for integrating ICT, and is targeted towards school teachers in various subjects.
- *Effective teaching-learning of computer science in schools*. This 4-week course was offered twice in 2017. The target participants were school teachers teaching computer science.
- *Foundation Program in ICT for education*, and *Pedagogy for online and blended teaching*. This is a 2-part course for college instructors intending to begin using ICT in their teaching. These courses were offered multiple times in 2016-18.
- *Basic 3D animation using Blender.* This 8 week course was offered in 2017 & 2018. The target participants included undergraduate engineering students, other graduates interested in animation domain and working professionals who wanted to learn the free and open source software for animation. The course also saw enrolments from school students. It is currently being offered on edX.

B. Evaluation

We have conducted studies in the MOOCs listed in the previous section, evaluating the overall MOOC persistence rates, effectiveness of the various LCM model features, and in terms of participants' engagement and perceptions of usefulness. Below we illustrate sample results.

- Results from *Educational technology for Engineering Teachers* MOOC (2016): The course had 3447 active participants, which constituted 67% of enrolled participants in the course, i.e. people who accessed courseware at least once. Course logs showed that 1201 (47%) active learners participated in the discussion forum generating 5023 discussion threads generating 9861 comments (i.e. 4 threads and 8 comments per active learner who participated in the discussion forum). The overall persistence rate, that is the number of participants who completed the course compared to the number of active participants was 37% [20].
- Results from *Pedagogy for effective integration of ICT for school teachers* MOOC (2017): Analysis of an end-of-course perception questionnaire on usefulness of LCM elements in the MOOC showed that 92% participants found LeD useful, 95% found

LbDs useful, 78% found LxIs useful and 90% found LxTs useful. In another question which asked about the role of Reflection Spots, 62% found them useful for reflecting on one's practice and 65% for thinking deeply about the content. A content analysis of an open-ended question elicited comments such as: '*Interesting LeDs, LbDs and well planned quizzes kept me going for the entire course. Overall I found this course useful and engaging*' [21].

- Results from *Pedagogy for effective integration of ICT for school teachers* MOOC (2018): This MOOC had 1691 active participants and they generated a total of 29355 posts as part of the LxI across 8 weeks. Qualitative analysis of the most active discussion thread in a week revealed that there were five different levels of interactions - *Opinionated elaboration*, *Elaboration*, *Superficial*, *Persistent interaction*, and *Asking information*. Majority (73.2%) of these discussions went beyond being superficial comments, and no scatter was seen in the discussion forums [22].

VI. Summary and Conclusion

In this paper we argued the rationale and proposed the LCM model for focusing on a learner-centric pedagogy in MOOCs. It is not sufficient for MOOC creators to simply make their course content and associated activities accessible to remote learners. In order to ensure learner engagement in a MOOC, it is necessary for MOOC creators to ensure that learner-centric principles are followed, i.e., learners go beyond passively watching or executing prescribed procedures, learners are made to think, figure things out for themselves, express their opinions, and learn from their peers. The LCM model helps instructors to create MOOCs which are learner-centric in nature.

The LCM model consists of Learning Dialogs that promote concept attainment through learner interaction, Learning by Doing which is a formative assessment activity, Learning extension Trajectories which advance learning along diverse paths, and Learner Experience Interactions which cultivate learning through focused discussion. We have applied the LCM model in multiple MOOCs on IITBombayX, and found high persistence rates, focused and engaged participation especially in discussion forums, and positive perceptions of usefulness of the LCM elements in the pedagogical format.

In terms of the generalizability of the LCM model, we found it to be applicable to a range of learners: traditional students, instructors, and working professionals. So far, we have applied the LCM model to a variety of skill development MOOCs as well as faculty professional development courses on different topics. Currently we are in the process of applying the LCM model for a MOOC in an undergraduate course in Electrical Engineering. Future work includes examining various domains and contexts in which LCM MOOCs are suited. More evaluation studies are also needed to understand the impact of designing and conducting a MOOC based on the LCM model.

As part of outreach efforts we have offered two MOOCs on IITBombayX (from May-Sept., 2018) for instructors to plan, design and conduct learner-centric MOOCs in their respective domains using the LCM model.

References

[1] https://www.class-central.com/report/moocs-stats-and-trends-2017/. Last retrieved, August 2018

[2] S. Mak, R. Williams and J. Mackness. Blogs and forums as communication and learning tools in a MOOC. In Proceedings of the 7th International Conference of Networked Learning, 275–285, 2010.

[3] K. Jordan. Massive open online course completion rates revisited: Assessment, length and attrition. The International Review of Research in Open and Distributed Learning, 16, 341-358, June 2015.

[4] R. Ubell, "How the Pioneers of the MOOC got it wrong," IEEE Spectrum, January 2017.

[5] National Research Council. How people learn: Brain, mind, experience, and school: Expanded edition. National Academies Press. 2000.

[6] H. M. Huang. Toward constructivism for adult learners in online learning environments. British Journal of Educational Technology, 33(1), 27-37, 2002.

[7] G. Salmon. E-tivities: the key to active online learning. 2nd edition. Routledge, London, UK. 2013.

[8] G. Siemens. Connectivism: A learning theory for the digital age. International Journal of Instructional Technology and Distance Learning, 2(1), 3-10.. 2005.

[9] I-C. Hung, Kinshuk and N-S. Chen. Embodied interactive video lectures for improving learning comprehension and retention. Computers and Education, 117, 116-131 (2018)

[10] K. R. Koedinger, J. Kim, J. Z. Jia, E. A. McLaughlin and N. L. Bier. Learning is not a spectator sport: Doing is better than watching for learning from a MOOC. In Proceedings of the second ACM conference on learning@ scale (pp. 111-120). 2015.

[11] K. F. Hew. Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS. British Journal of Educational Technology, 47(2), 320-341, 2016.

[12] M. Bali. MOOC pedagogy: gleaning good practice from existing MOOCs. Journal of Online Learning and Teaching, 10(1), 44. 2013.

[13] L Guàrdia, M Maina, A Sangrà. MOOC design principles. A Pedagogical approach from the learner's perspective. eLearning Papers, 33, 2013.

[14] L. S. Vygotsky. Mind in Society. Harvard Univ Press, Cambridge, MA. 1978.

[15] T. L. Good and J. E. Brophy. Looking in Classrooms. Harper Collins College Publishers, New York, NY. 1994.

[16] M. Prince. Does active learning work? A review of the research. Journal of Engineering Education, 93(3), 223 - 231. 2004.

[17] J. Lave, J., and E. Wenger. Situated Learning: Legitimate Peripheral Participation. New York: Cambridge University Press. 1991.

[18] P. Black and D. Wiliam. Inside the black box: Raising standards through classroom assessment. Granada Learning. 2005.

[19] D. R. Garrison. Online community of inquiry review: Social, cognitive, and teaching presence issues. Journal of Asynchronous Learning Networks. 11(1), 61-72. 2007.

[20] G. Banerjee, J. M. Warriem and S. Mishra. Learning experience interaction (LxI): Pedagogy for peer-connect in MOOCs. Proceedings of the 26th International Conference on Computers in Education, ICCE 2018. Philippines. *(accepted)*

[21] V. Shah, G. Banerjee, S. Murthy and S. Iyer. Learner-centric MOOC for teachers on effective ICT integration: Perceptions and experiences. *(Submitted to T4E 2018)*

[22] J. M. Warriem, S. Murthy and S. Iyer. Shifting the focus from learner completion to learner perseverance: Evidence from a teacher professional development MOOC. Proceedings of the 24th International Conference on Computers in Education, India. 2016.