

Increasing Interactivity and Collaborativeness in MOOCs using Facilitated Groups: A Pedagogical Solution to meet 21st century goals

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Abstract—Massive Open Online Courses (MOOCs) are education technologies which capable of teaching thousands of students synchronously. The pedagogy in MOOCs are focus on decentralized learners where students watch videos, take quizzes, submit assignments and discuss using forums. This pedagogy is focusing on the didactic method of teaching. However, the students in 21st century are more connected and networked to learn effectively. Present and future workforce require critical thinking, communication, collaborative and creative skills, yet MOOC pedagogy does not support to upskill the required. This research introduces a facilitator driven group learning pedagogy inspired by cMOOCs. Pedagogies behind 7 different MOOC platforms were analyzed to understand existing models. Surveyed literature on empirical research of MOOCs success factors in order to propose and conceptually design the model “GroupMOOC”. This will increase the student interactivity, provide a medium where they can collaborate and be creative. The paper explains the detail design goals and analogies behind features.

Keywords—MOOC, group learn, pedagogy, online learning, learning design

I. INTRODUCTION

Massive Open Online Courses known as MOOCs are considered as an education technology. It differs to a typical online learning model by being able to cater massive number of students while having open enrollments where any student in the world can enroll to the course either to audit the course for free or earn a certificate at a nominal fee. At the same time, pedagogy behind a typical course in a MOOC platform consist of 1) Small chunk of video lectures 2) Peer graded/ computer graded or self-graded assignments 3) Frum posting and sometimes 4) Quizzes [1]. The MOOCs which follow this pedagogy is considered as xMOOCs and since 2012 it became the hype after introduction of MOOC platforms Coursera, edX and Udacity.

However, since then, some media emphasizing that MOOCs are fading and recently Udacity has claimed that MOOCs are dead saying that it is only focusing on content orient learning “MOOCs have been too content-only focused and not a model that engages our students deeply.

They are an improvement on pure content libraries when done well, but as a product not what we felt achieved success for our students and industry partners” [2]. In other words, this claim brings back the doubts that researchers and educators had when the time of introduction of MOOCs. They were arguing that MOOCs do not cater to the needs of 21st century [3].

21st century needs are the collaborative skills, communication and corporative skills, critical thinking and creativity. Researchers claim that the typical xMOOC models focus only didactic education where learning theory focus on information transfer. Living in 21st century, industry requires students to learn to work on wicked problems (the problems do not have one defined answer yet there will be many solutions for a given problem) which requires diverse teams to collaborate and communicate. Online learning in MOOCs with diverse learners will be a great opportunity for students to learn and practice the skills [4]. Yet, the xMOOC treat students individually and the learning process is decentralized. The only opportunity for students to communicate is the forum tool yet in some MOOC platforms hardly seen interactions which demotivates to communicate.

However, cMOOCs pedagogy deviate from xMOOCs since it does not focus on videos, quizzes as structured content, rather focus on the network of learners. Open discussions and interactions between interested parties are widely exercised [5]. But, it is often leads to confusions to the new learners who are used to structured learning process. At the same time, there is no guarantee that every student will be interacted with fellow learners as the many of the cMOOCs use blogs as a main medium to articulate the knowledge and use twitter and forums in communicating [6]. Many of the MOOC platforms do not have the ability to continue group projects and there is lack of designed pedagogies to cater the needs.

In this research, we explored the pedagogies and designs of seven different MOOC platforms, identified the gap of the pedagogical design which need to cater to the next generation workers. After analyzing background of the existing pedagogical designs, we present a novel pedagogical design “GroupMOOC”. In this paper, we explain the analogies behind GroupMOOC’s design goals using methodologies explain in human computer

interaction (HCI). This will aid to educationists, platform developers and designers to artifact a model which provide better learning experience to the participants in the future.

II. OBJECTIVES AND MOTIVATION

Main objective of this research is to synthesize a novel pedagogical design. Open educational technologies could use this to fill the gap between demanded skill competences in next generation workforce. To achieve the main goal, exploring and analyzing existing pedagogies behind the existing MOOC platforms became sub objective. Subsequently, we introduce a pedagogical design “*GroupMOOC*” and also explain the analogies behind the propose model.

We framed our solution towards collaborated groups because with rapid surge in development of MOOCs, researchers have stressed on the importance of MOOC learners group collaboration [7] [8] [9]. However, given the magnitude of students diversity and the number, it is not easy for students to form groups effectively, neither the MOOC platforms do not have designs which facilitate the grouping process and lead effective teamwork. Team formation and pedagogical approaches to group work in MOOCs underrepresent in online education research and in this research, we explore exiting models and propose an approach using social science and human computer interaction perspective.

III. BACKGROUND OF THE RESEARCH

The pedagogy or the question of “how can we effectively teach thousands of students?” was mainly addressed using technology and Massive Open Online Courses (MOOCs) became a prominent answer. In the early 2007 Alec Couros had Social Media and Open education course EC&I 831 open to anyone in the web to enroll in to the course where non-credit participants joined as an encouragement of networking and sharing knowledge [10]. Subsequently, 2008 & 2009 George Siemens Stephen Downes, connectivism cck08 and 2011 George Siemens, Jon Dron, Dave Cormier, Sylvia Currie and Tanya Elias LAK11 courses were designed to open for public not for credit but for learning with a knowledge network. Pedagogy behind these courses were identified as cMOOCs or the connectivits MOOC [11]. The network is valued as knowledge nodes and more connections impact the knowledge. Below figure 1 explains the network learning paradigm embrace by cMOOCs [12].

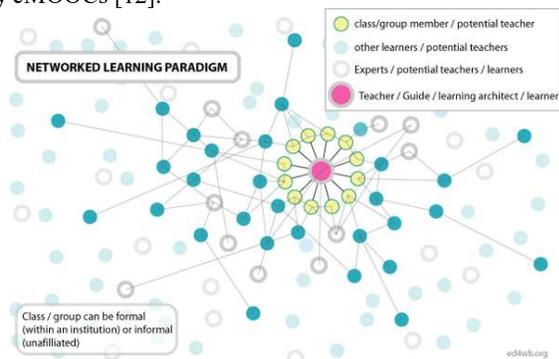


Figure 1: Network Learning Paradigm embraced by cMOOCs [12]

However, in 2012 when Coursera, edX and Udacity were introduced, a new structure of MOOC emerged identified as xMOOCs, yet it is a visible pedagogical step backward. Mainly due to the reason, watching video lecture recordings, read course materials, complete assignments, take quizzes and an exam rolled back the rich pedagogical innovations from earlier MOOC’s [13]. Simply it is considered as a migrated campus-based didactic method of teaching to the online environment. Learning considered as not only just acquiring a body of knowledge and skills. Learning happens through relationships [14]. Online learning pedagogies can be incredibly social, even more than campus-based courses - MOOCs should use this long-standing practice [15]. Researchers have revealed xMOOCs has failed to provide the skills needed to face 21st century challenges. Yet, xMOOCs have gained many participants and still institutions invest on creating new MOOCs. The research on identifying MOOC success factors recommend that creating more interactivity and engagement between students and introducing more collaborative work leads to higher satisfaction [16].

A. MOOC problems

Gleaning into MOOC pedagogical practices, Bali [17] explains the problems arose during the participated 4 courses in MOOC platforms. According to the authors findings, courses expanded between 12 weeks to 5 weeks. Assignments with strict deadlines to flexible and high forum usage to less forum usage was another observed difference, yet the author points out the pedagogy is mainly based on behavioral learning theory and it does not provide higher order thinking ability where students would be able to conceptualize and retrieve meta cognition. Other problem stated in MOOCs is the teaching style in the video’s. Many of the xMOOCs based on video’s and each course has different styles, instructors talking, conversation type videos, presentations, reading slides and many more. Researchers emphasize that student engagement is very less in courses when long hours of videos and sometime highly engaged classroom lecturer videos are not effective when it is used in MOOCs [18]. At the same time research on evaluating whether MOOCs are providing 21st century skills resulted majority of MOOCs does not comply with the skills. The researchers empirically evaluated using MOOC students to explore if the MOOCs provide critical thinking, collaboration or provide opportunities to effectively communicate [19]. According to the studies, learner’s perspective of MOOCs found that courses need more collaborations, peer to peer interactions, and also networking opportunities. At some MOOCs platforms students complain the overwhelming intense of forums post to communicate and being lost in finding the better thread to contribute [7], at the same time after the changing model of Coursera courses to paid model, it was found that forums are hardly being interacted by students [20] and if students were engaged more socially it was found to be more effective.

B. Pedagogical directions towards “groups”

Social interaction is a crucial part of learning. Main method of interaction in MOOC platforms are to use forums. Although, many MOOCs have forums, it has found that not many meaningful interactions exercise in it and only less than 10% of students take part on those discussions [21]. Team work or groups were identified as next potentials for increase interactions and learn effectively in MOOCs. Majority of MOOC platforms does not facilitate team base or group work. Researchers quote that a social learning platform NovoEd’s technology encourages active and peer learning through team-based exercises [22]. With the team-based courses in NovoEd report a higher completion rate than traditional MOOCs. Nevertheless, not all teams are found to be successful. Some of the online groups said to be dependent on the founders of the groups, but not necessarily MOOC groups but in Facebook groups [23]. In the recent study done by [24] on NovoEd courses revealed that more than half of the teams fail to submit the final team project which leads to ineffectivity of the teams. Previous researchers found that if teams to succeed in virtual environments they require support to function smoothly [25]. At the same time grouping in MOOCs was explored by the instructors of the course “Creativity, Innovation, and Change” MOOC offered by Penn State University via Coursera. They assigned volunteers to groups based on their preferences [26]. They found that assigning learners to groups based on their preferences did not enhanced their performance or completion of the course nor interactions has not been significant. Online courses team formation studied by Gloor et al. [27] revealed that teams formed by students knowing their social positions and contribution patterns exhibited balanced communication behavior and performed best. However, given that his research focused on only 50 student’s groups and providing autonomy to students to form teams and monitoring their social network position might have been fine. When it comes to MOOCs expecting massive number of students But, considering the scale of MOOCs, and with such diversity researchers argue it might not be enough to rely on simple team formations but proposed dynamic team formation based on various measurements such as diversity in experience, forum participation, skill level, interactions level using networking measurements [28].

However, not as other systems, in considering effectiveness of teams in open online learning, it is important to understand impacts, success and fortitude of learning ecosystems and how can we facilitate them. Human dynamics, the study of how people work as a whole system – mentally, physically, and emotionally can spur that foundational story behind what fuels an ecosystem. Lifelong learners in MOOCs are the potential learning eco system. Therefore, new designs for open learning environments will become the architecture in building an ideal and sustaining learning ecosystem. When built from an innovative, adaptable and connected foundation rooted in human dynamics, a learning ecosystem can evolve and withstand the unpredictability of the shifts that rock foundations.

IV. METHODS AND FINDINGS

A. Research questions

The main research questions we will be addressing

- What are the existing pedagogical models of MOOCs?
- What problems arise in existing MOOC pedagogies?
- What factors are leading to a satisfactory student learning experience?
- How can we use those factors into existing MOOC model and re-design a MOOC pedagogy?

B. Sample data and execution

In order to understand the existing pedagogies, 7 different MOOC platforms were analyzed. Identifying the problems and the impact, we reviewed literature and focus on MOOC problems. At the same time the students experience in MOOCs and success factors were explored using the literature which has focused on empirical research. Next, based on the key factors that does not exist in current pedagogical models, a novel pedagogy is introduced using a conceptualize idea of “facilitator driven groups” and this pedagogy prototyped as tool “GroupMOOC”.

C. Exploring the pedagogical models of MOOC platforms

It has found that many MOOCs are different from each other at the platform level and course level. Which means MOOC providing platforms such as edX, Coursera etc, has its own technological designs driving the teaching yet sometimes each course in same platform found to be different in its instructional design [29]. In this research we explored 7 MOOC platforms. In order to structure our pedagogical analysis, we aid dimensions supported by researches [30] [31] [32] [33] as

- 1) Objectivist or connectivist approach
- 2) Teacher centric or student centric approach
- 3) Convergent activates or divergent activities
- 4) Any space for cooperative learning
- 5) Content is abstract or concrete
- 6) Feedback frequency and time and by whom
- 7) Users are active or passive
- 8) Assessment methods
- 9) Degree of Collaboration
- 10) Degree of Communication

The below Table 1, summarizes the explored xMOOCs and analysis based on the aided dimensions.

Table 1: Summary of pedagogical analysis

	Summary of Pedagogical Approach
Coursera	Courses duration average between 4 to 8 weeks, mostly quizzes are mechanism to evaluate the learning. Some courses contain self-evaluations, some contain peer evaluations. Forum as the medium to communicate expected students to

	contribute. Each lecture video has a discussion space, but not many posts. Students have mostly nick names in their user names and not much information about students in the profile. Student to student communication is limited and collaboration in working is violating the code of conduct on assignments.
edX	Course duration average between 4-10 weeks. While video or end of a lecture session quizzes, type answers and forum contributions as answers to questions, peer reviews or self-reviews forums are sometimes answered by Community TAs or relay instructor or other participants, Although there is a higher usage of forums, the students always have a unidentified nick names in their user profiles and not accessible of information to others. Collaboration between students are limited by the design as no opportunities within the system
FuturueLearn	Courses averaged to 4-7 weeks long, not much quizzes during the video's, but after the week or end of the course many quizzes to take, not all courses had peer evaluations, but some. Way of communication and collaboration is forum post which is active. Activities are mostly straight forward and collaboration is not utilized in the pedagogy.
NovoEd	Not many courses offered for general crowd as MOOCs. Courses averaged to 4-6 weeks. Some course offered team registrations, some courses allowed to work alone. Course students were easily accessible and communicable with profile. Assignments are mostly peer evaluated, but blind peer evaluations as every other MOOC platform. Forum usage is encouraged and mostly people communicated though forums and users can tag to persons in forums and address the any point. Typical lecture video and some content reading in weekly modules, some teams are highly active and some are really not active.
Open2Study	Typical video lecturers, sometimes quizzes no forum participation interactions and no peer reviewing experience but end of each module or week, assessment with quizzes. Course duration typically long for 4 to 8 weeks. All courses included video lectures. Students are not having any profiles and no means of communications.
Iversity	Course duration are typically 4-6 weeks. Forum is often in active; forums post is at each video level. Peer review and self-review including quizzes as assessment

	methods. Student engagements are considerably less in forum posts. Collaborations are not facilitated. Highly based on video lectures and activities are mostly implicit.
Canvas	Highly dependent on the course, instructional design. Curated content and some courses did not contain video's not quizzes. Highly engaging forum community. No collaborations and some courses does not include any assessment. Main communication method is forum posting yet students can send messages to peers.

D. Problems and gaps in pedagogical models of MOOCs

The key difference in xMOOC and cMOOC is identified by how it is structured. xMOOC lean towards instructive approach and cMOOC follow more connectivist approach. The lose structure in cMOOCs found to be difficult in following by novice and typically suited for well self-motivated students. The behavioristic approach by xMOOC does not appeared to be providing the skills needed by students who face 21st century challenges. xMOOCs are more and more lean towards decentralize system limiting students to student, student to instructor interactions. Learners are isolated in their learning environment and less motivated to commit to course activities.

However, pedagogical gaps and metaphors are described by [33], used a tool named AMP (Assessing MOOC Pedagogies) to distinguish between MOOCs. This research found that learnings in MOOCs are fluctuating among pedagogical model acquisition, participation self-direction.

Latest research in identifying differences in MOOCs found that all courses corresponded to the idea of an xMOOC in that they were run on a model of instructional design. However, the course materials varied in respect to media used, use of networking, discussion forums and degree of openness. In terms of assessment, all MOOCs used formative approaches, all had automated responses but only some had summative and peer assessment [34]. The missing key components in MOOC pedagogies were identified by Miller [35] as Teacher/learner interaction and development of learning communities. The researcher [36] restating the argument and gaps in pedagogy by emphasizing the need for networking. Therefore, considering MOOCs, principles and characteristics of the pedagogical framework it should become clear why

1. Collaborative
2. Interactive
3. Networked learning framework

for effective MOOC design will be able to meet the 21st century goals. These components are at higher priority in considering new MOOC environments.

E. Delivering a stasifactory learning expereince

A typical scenario of the learner in a MOOC can be explained as, login to the MOOC platform by intention or with a reminder

sent though an email. Watch video's, take quizzes and comment on forum. Commenting is highly deviating in pedagogy. Mostly instructors request to introduce where most flooded forum posts to be seen yet depend on the questions ask and depend on interface facilitation, students answer in the forum. In a flooded forum situation, it is unlike that students find meaningful interactions. At the same time, if student desired to collaborate with other students in participating the course, the platform limits the opportunities in identifying potential students to collaborate. When it is to conduct peer reviews, students often complain lack of quality review or lack of review at all. These are all consequences of lack of trust in between students and lack of incentives to be motivated in providing an effective feedback.

In this research, we frame those problems to bring insights where we can prototype design interventions. Considering the 3 gaps identified based on analysis of pedagogies, we frame our design goals to provide 1) Learner Empowerment 2) Learner orientation and structured plan 3) Collaborating in work with team 4) Social Networking 5) Peer assistance 6) Assessing and Feedback.

F. Proposal for hybrid pedagogy : GroupMOOC

We aim to produce a hybrid pedagogy where it resembles a cMOOCs networking and peer interactions yet framed to be more structured than existing cMOOCs. At the same time following xMOOC structure to focus on content yet deviating from decentralized, isolated learning to small groups to focus and collaborate on the subject matter.

Structure of the propose pedagogy can be explain by 4 steps. Figure 1 explains the structure of the GroupMOOC.

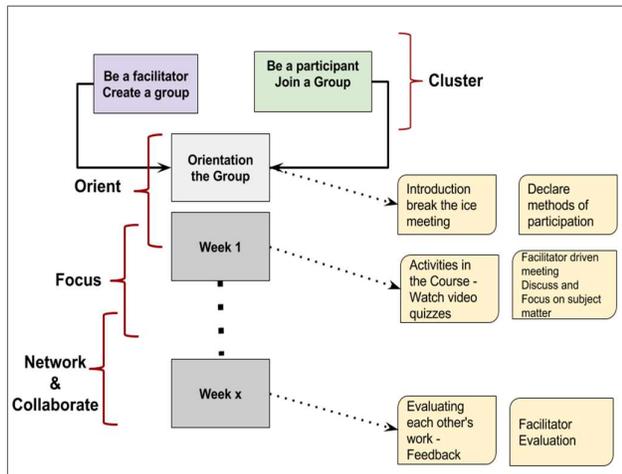


Figure 1: Structure of the GroupMOOC

- Step 1: Cluster

At the beginning of each course we propose to be divide into groups. Some researchers argue on automated grouping techniques based on student factors [28]. We deviate from it by adding a deliberate role of *facilitator*. Facilitator is a key role in the GroupMOOC who will be the creator of a group. They are

empowered students who has special interest in driving the groups. As to motivate and sustain the facilitators, incentives such as meeting with instructor, discounts on course fee (if applicable) could be enable by instructor. Participants will be able to request to enter groups or assigned automatically to the groups created by facilitators. Group size can be varying between 5-10 participants. Participants and facilitators as participants will have a star rate on their profile based on their activates in the group. Groups will have a score based on the activities and interaction within group. A leaderboard will indicate the active groups and activity levels and key highlights to motivate other groups and identify and network with each other. Figure 2 reflect the basic structure of groups, it explains that the platform can have many groups and some groups are following other groups based on the interest.

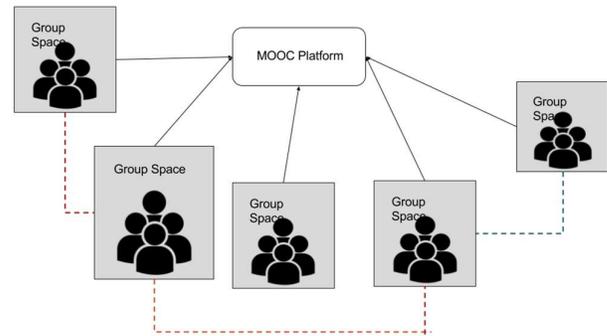


Figure 2: Group structure in GroupMOOC

Recommender system and underneath algorithms are introduced in order to better connect the groups. As per usability perspective, displaying the active groups, active participants with levels motivates and stimulate other students to actively take part in the activities. As researchers revealed [37], the social bonds are affecting to the attritions of MOOC participants, it is important to understand more about how bonds begin to form in the interactions. Students who join courses will likely to complete with a great bond of interactions with a group. In this proposal not only, we introduce grouping to the MOOC but also the human component of the successful bond the “facilitator” who will be responsible for keeping a great track of their group.

- Step 2: Orient

In any organization or community, it is important to provide a structured orientation where new members will have a clear understanding of policies and procedures of communication and collaboration. In a MOOC where students meet for first time, it important that they are well informed of the plans. At the same time, successful open communities practice these phases and we introduce this concept to the small partially closed groups in open learning in MOOCs. As we introduced the “facilitator”, his/her role will include the orientation. Facilitator will drive into a consensus in when to meet online, the space to meet (using google or skype etc.) and how will their communication plan in upcoming discussions. Importantly orientation will provide the guidelines on how to conduct online meeting, and also the first

step of bonding with each other by introducing themselves. We highlight that the identity is an important factor [38] in learning and through the GroupMOOC identity is visible as it will stimulate the social networking more effectively.

We draw inspirations from the research which introduced small groups hangout sessions “Talkabout” [39]. As per empirical evidence reflected, the structured plan for discussion and introduction leading to better engagement in small groups, we anticipate the orientation will set the right stage to engage in better interactions.

- Step 3: Focus

Once the group is formed and team is introduced with a clear protocol of communication and interactions, it is important to focus on the content. In a cMOOC, the problem occurred for students in identifying focus points as sometimes it does not carry a well-organized structured content as in a xMOOC. However, well-organized content itself will not provide a better learning and hence we provide a stimulating situation where known group of students will be discussing, co-creating and thinking-aloud of the content they learn in the xMOOC. GroupMOOC pedagogical framework will enable a facility of focusing on the content with a group of students who can share the conceptual learnings. Focus stage is ideal for discussions on subject matter and since the group is small and having an interaction relationship, it is likely to have a meaningful continued discussion where in other situations, it is less likely that students may contribute to your discussion in a continuous and meaningful manner.

- Step 4: Network and Collaborate

Currently, xMOOC platforms are not designed to deliver any group work nor the collaborativeness in the pedagogy is limited to forums. In order to better collaborate, it is essential to focus on a group which could work continuously for a period of time. Collaboration will stimulate by offering a collaborative space for a group where they could share their materials, discussions in a meaningful way. NovoEd [40] currently provide a similar space where teams can collaborate, yet the platform is limited with very small number of open courses and also team formation and facilitating is different as the pedagogy is different achieving collaboration. The proposed GroupMOOC will enable collaboration to any student group even if the xMOOC does not consist of a collaboration component. Our intention in this pedagogy is to enhance learning in a meaningful manner. It is vital that group of students discuss and build co-create on the artifacts based on the knowledge. GroupMOOC will introduce a feature in the team space where collectively team can decide an artifact which the team will be creating collectively based on the focus content they take. It is identified by many researchers [41] [42] that building together collaboratively is increasing the learning, and yet MOOC model is deviating from enhance learning to effectively delivery of content. At the end of the course team can publish their artifact in to the total participant community where other teams can view the output and provide feedback. End of the final week of the MOOC, each team will be evaluating each other and the evaluation intend to be structured where it will gather the feedback and final scale or the rating will determine each team members reputation.

V. DISCUSSION AND FUTURE WORK

In this research we presented a proposal to a new scalable innovative pedagogy for MOOCs. The model is derived drawing inspiration from the network learning theories of cMOOCs and considering the success factors of xMOOCs. We believe this hybrid approach will retain many students engaging in the courses and the diverse participation in a course will be well utilized. Diversity will open up to many viewpoints and therefore enhance the critical thinking ability. Working in a group will assist to gain experience in collaboration and communication skills. Although it might be challenging to derive best algorithm to form groups, with many data and behavior analysis, in future it will be an area that researchers focus as a research direction.

In order to test this pedagogy, it has to be design to a tool which will be using the framework in the pedagogy. The tool can be integrated to the existing MOOC platform or as a LTI (Learning Tool Interoperability) model or A cloud solution where students can take course and groups using GroupMOOC as a web service as a platform, where they use to watch At the same time, the artifact that we prototype in testing the pedagogy need to be tested with much higher number of participants and in future we will be working towards enhancing the number courses to use this integration in online courses.

Teacher/learner interaction and the development of learning communities online are two missing components in MOOCs. Student learning outcomes can be achieved in MOOCs as in online, but stronger persistence is required. Some features such as learning support services are needed in MOOCs to aid in persistence [43].

Building sustaining learning ecosystems requires a shift in mindsets. It is critical to have an experimental mindset in creating a learning ecosystem in order to ensure it is future proof. Also having a learner-driven, growth mindset in establishing the foundation based on the principles of human dynamics solidifies that it is grounded and strong enough to withstand the tumultuous changes yet to come. If it is built based on the learner needs, the human dynamics drive the design, then it becomes more than just the latest fad in a grouping of the hottest technologies but rather it becomes a foundational ecosystem that can evolve with the changing systems that operate it and drive the adoption and engagement anticipated.

VI. CONCLUSION

In this research, we address the MOOC pedagogical problems and illustrated the pedagogical difference using 7 MOOC platforms. Many attritions are in MOOCs due to lack of interactions which does not provide enough interest or motivation for students to continue. Although some MOOC platforms offer group base learning, some courses do not provide enough interaction with in a team. Synthesizing from existing literature and the exploration on MOOCs platforms, we present a networking and collaborative environment. Specially, we present the “facilitator” role in team formation where a person uniquely driving the team.

Our research clearly identified the gap in MOOCs are the 3 areas (collaboration, Interactivity and Network and collaboration) which MOOCs need to be considered in introducing effective new pedagogies. The hybrid pedagogy that we introduced will be a mix method of cMOOC pedagogy and xMOOC. We tried to enhance group learning which will deviate from didactic learning to small groups who with cluster, orient, focus and finally collaborate and network with each other. Their actions will impact in the group where recommender systems will accumulate its score which brings a reputation for the participants.

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