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MOOC-Based Online Instruction

A Case Study in Teacher Education

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If taking a flipped learning approach, MOOC content can be used for online pre-class instruction. After which students can put the knowledge they gained from the MOOC into practice either synchronously or asynchronously. This study examined one such, asynchronous, course in teacher education. The course ran with 40 students over 13 weeks from February to May 2020. A case study approach was followed using mixed methods to assess the efficacy of the course. Quantitative data was gathered on achievement of learning outcomes, online engagement, and satisfaction. Qualitative data was gathered via student interviews from which a thematic analysis was undertaken. From a combined analysis of the data, three themes emerged as pertinent to course efficacy: quality and quantity of communication and collaboration; suitability of the MOOC; and significance for career development.

1 Introduction

In March 2020, when COVID-19 hit, universities were forced to move online rapidly and at scale. However, creating online courses is time and cost intensive. To overcome this, many institutions started to use pre-existing massive open online courses (MOOCs) as they provided ready-made, quality materials on which universities could base their existing courses by adding online lessons. This was supported by companies, such as edX, who offered thousands of courses free to universities when campuses started to close. While this provided a temporary solution, effective learning with such MOOCs will only take place if they are carefully planned and underpinned by pedagogical learning philosophies [10] that encourage learning, engagement, and student satisfaction [14] and are adapted to suit local conditions for learning [18]. However, there is currently limited research into how MOOCs can be effectively incorporated into university settings in this way [18]. The current study investigates the effectiveness of one such systematically planned MOOC-based course following a flipped approach as a part of MEF

University's micro-credential program. MEF came up with the micro-credential program in order to better orient itself with the changing paradigm in education, the digital age [16], and to address the needs in the higher education sector. To embrace the digital age paradigm shift, MEF University realized that it is vital to recognize "informal learning" and that "learning is a continual process, lasting for a lifetime" [16, page 1] as well as to give learners more autonomy and choice over their learning journeys. Tackling the needs of the higher education sector was the other reason behind MEF's micro-credential program. "Employers are no longer able to differentiate between the quality of degrees from different institutions, and [...] the specific skill sets that graduates have obtained." [15, page 109]. Incorporating micro-credentials allowed for the informal learning that MEF students were already taking part in to be formally recognized, in return making students more employable. MEF University's micro-credential program is as follows: Students are given the opportunity to design their own elective course modules based on existing modules on online platforms such as edX. To do this, students come together into groups, discuss their needs, and investigate existing courses. They then put a proposal to their faculty mentor and, on approval, pursue the online course of their choice. The purpose of this research is to investigate the efficacy of the design and implementation of one of these courses, Flipped Learning in Education, from the perspective of the students and the instructor.

2 Literature Review

MOOCs bring many positives, such as benefiting future careers, [12], gaining motivation through completion certificates (Hew and Chung, 2014), and effectively meeting users' learning goals [4]. Originally, cMOOCs, driven by connectivism, were designed to offer free, open access education to a massive number of learners. These provided a highly learner-centered learning experience as learners shared and built their knowledge collectively. Later, extension MOOCs (xMOOCs) appeared, following "behaviorism, cognitivist, and (social) constructivism learning theories" whereby "learning objectives (were) pre-defined by teachers who impart(ed) their knowledge through short video lectures [...] followed by simple e-assessment tasks" [19, page 311]. However, these are instructor-centered and have limited peer-assessment and peer-communication. More recently, blended MOOCs (bMOOCs) have appeared, with both online and in-class instruction, which can motivate students, increase commitment to the course [19], and reduce frustration learners feel if unable to ask and answer questions in real time; this also leads to increased course completion, and provides an online community of learners [8].

Also, as tutor support is provided and learning is paced, there are less issues with student self-motivation due to bulk learning [2].

Regarding university courses developed from existing MOOCs or online materials, three studies emerged from the literature. Kloos, Munoz-Merino, Alario-Hoyos, Ayres, and Fernandez-Panadero [11] had their students work from home on MOOCs prior to class, then attend one on-campus class and one lab per week for problem-solving and reinforcing understanding. Assessment was project based. Their results show “a positive reaction from the vast majority of students, who appreciate the practical focus of the courses, leaving more time during face-to-face sessions to solve doubts or problems” [11, page 969]. However, challenges included getting students to complete the online activities before classes, and a high workload for instructors due to material preparation, course refinement, and grading high numbers of project-based assessments. Munoz-Merino, Ruiperez-Valiente, Kloos, Auger, Briz, Castro, and Santalla used Khan Academy videos as pre-class content for a remedial physics course, after which students practiced concepts in face-to-face classes; their findings show that, when using online materials, student satisfaction, grades, and levels of interaction with the online content were high and “activity distribution for the different topics and types of activities was appropriate” [13, page 2]. Hung, Chih-Yuan Sun, and Liu [9] investigated the effect of MOOC-based flipped classrooms on learning motivation and learning outcomes, using surveys to gauge student motivation, a semi-structured open questionnaire to understand students’ feelings, and a quantitative test of learning achievements. Their results show that flipped learning, when integrated with MOOCs and game-based learning, can enhance students’ learning motivation and outcomes.

Flipped learning involves instructors creating pre-class materials, such as videos and quizzes, that students access online prior to class. Then, class time involves learning activities in which students apply knowledge with the assistance of the teacher or peers. Traditionally, flipped lessons took place face-to-face in classrooms on campus. However, as recently there has been an emergence of online flipped learning with lessons taking place in virtual classrooms, some discussion as to the difference between traditional and online flipped learning has surfaced. Honeycutt and Glova [7] believe the key to flipped learning is not the difference between what happens in class versus out of class, but a focus on “what students are doing to construct knowledge, connect with others, and engage in higher levels of critical thinking and analysis” (para. 10). They recommend instructors find technological tools that allow them to adapt strategies they use in face-to-face classes to engage with their students in the online environment. Swart and MacLeod [17] concur; they took the principles of traditional flipped learning and applied them to a traditional and an online course in analytics. Their results suggest the principles in traditional flipped learning are transferable to online flipped courses, yielding student satisfaction equivalent to traditional flipped courses. DeVita, Lanier, Parker,

Boersma, and Hicks also believe the traditional flipped approach can be used with online flipped courses; however, they opine that “applied learning strategies that require active engagement, critical reflection, and collaboration with peers and other stakeholders are especially meaningful [...] in online flipped courses, (as) they help compensate for the physical and virtual distances that exist between students and faculty” [3, page 146]. To underpin flipped learning with pedagogical learning philosophies that encourage effective teaching and learning, in 2018, the Academy for Active Learning Arts and Sciences (ALAAS) developed the Global Elements for Effective Flipped Learning (GEEFL) [15]. This consists of 187 elements, grouped into 12 families (Figure 1), which we reference throughout this paper. For example, (Pb P-5) refers to the family Planning for Flipped Learning, and to element five, Plan Using Bloom’s.

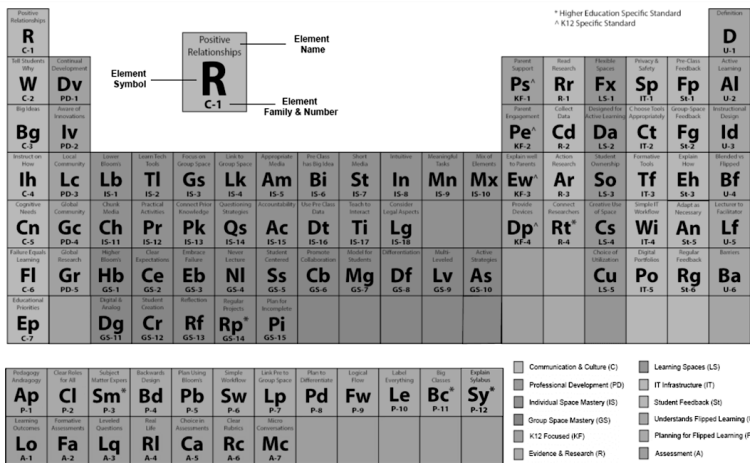


Figure 1: The global elements of effective flipped learning

3 Research Context and Course Design

After the system was announced, a group of Faculty of Education students expressed an interest in taking a Flipped Learning Global Initiative (FLGI) MOOC: *Flipped Learning 3.0 Certification Level – I* (n.d.) and, on its release in March 2020, the *Rapid Transition to Online Learning (RTOL)* (n.d.). One of the authors was allocated as

an instructor to design learning outcomes, an end-of-semester project, and a course curriculum from the MOOC content. The course was titled Flipped Learning in Education Elective. When designing the course, first, the instructor took the course overview of the Flipped Learning 3.0 MOOC, considered the content, reflected on local needs [18], developed learning outcomes that follow Bloom's taxonomy (Pb P-5) with a focus on higher levels of thinking and analysis [7], and included strategies that involve active engagement [3]. Second, she designed assessments in line with the learning outcomes (Lo A-1). For the end-of-course performance task, a Backwards Design approach was followed (Bd P-4), that mirrored real life (Rl A-4) whereby students had to use and apply information and skills they had gained [3], while working individually [17] and being supported by a clear rubric (Rc A-6). For the task, students were expected to choose a skill (e.g. cooking, animation), imagine a situation where they may need to teach that skill, and develop a flipped lesson to teach it. Peer-evaluation was included [17] and self-evaluation to get the students to critically reflect on their development [3]. Table 1 shows the assessment structure. The instructor had planned for students to teach their flipped lessons on campus; however, this had to be cancelled due to campus closures. Therefore, the assessment weighting was readjusted. Third, units were developed with a simple (Sw P-6), logical (Fw P-9) workflow, with paced learning [2]. Fourth, the instructor designed the IT infrastructure, using appropriate systems and tools (Ct IT-2) to support active learning (Da LS-2), which included the FLGI MOOCs, a learning management system (LMS), a virtual meeting space, and communication and collaboration tools. These were accessed via the university LMS. The details of the IT Infrastructure used are given in the results section (Table 3).

4 Research Methodology

The purpose of this study was to investigate the efficacy of a MOOC-based flipped online course from the perspective of the students and instructor. The course ran with 40 students over 13 weeks from February to May 2020. To evaluate efficacy, the following three indicators were used: student achievement of learning outcomes [9], engagement with online materials [13], and satisfaction [11, 13]. The following research question guided data collection *"How effective was the Flipped Learning in Education course regarding student achievement of learning outcomes; engagement with online systems, tools and materials; and satisfaction?"* This research follows a case study methodology, with mixed methods. Quantitative data for achievement of learning outcomes was gathered by taking grades for each assessment from the LMS grade center, following [9]. For engagement with the online systems, tools and materials, data were collected from the LMS, FLGI MOOCs, the virtual meeting space, and

Table 1: Assessment structure

Bloom's	Learning Outcomes	Area	Detail	%	Rubric
Remember & Understand	Define flipped learning (FL)	MOOC Certification	Flipped Learning 3.0	15	N/A
			RTOL Course	5	N/A
Apply & Analyze	Illustrate what makes a good FL lesson	Synchronous Online Lesson	Pre-class Quiz	5	N/A
			Participation Online	5	N/A
Create	Design a FL lesson	End-of-course Performance Task	Design a Flipped Lesson Plan	25	Yes
	Produce an effective pre-class video		Create a Pre-class Video	10	Yes
	Create online materials		Create Online Materials	10	Yes
	Teach a flipped lesson		Teach your Lesson	—	—
Evaluate	Evaluate the effectiveness of flipped lessons	Peer and Self-evaluations	Evaluate a Peer's Video	5	Yes
			Evaluate a Peer's Online Materials	5	Yes
			Evaluate Your Own Lesson	5	Yes

communication and collaboration tools, following [13]. For satisfaction, an anonymous questionnaire with 23 questions, (1 strongly disagree – 4 strongly agree) was sent at the end of semester via Google Forms, following [13]. The qualitative data was used to get a more complete explanation of indicators under investigation. Four students were interviewed by a research assistant in 30-minute, individual, semi-structured interviews with open-ended questions, recorded, transcribed and anonymized. This was done via a virtual office on Blackboard Collaborate for data collection via interviews, and LiquidText software was used for data analysis which was conducted following Braun and Clarke's [1] thematic analysis. Following Griffiths, Chingos, Mulhern, and Spies's suggestion that instructor interviews may be used as a legitimate instrument for data collection, the course instructor was interviewed by one of the authors through written communication with open-ended questions via email.

5 Results and Findings

To answer the research question "How effective was the Flipped Learning in Education course regarding student achievement of learning outcomes; engagement with online systems, tools and materials; and satisfaction?" the researchers looked at the results for each of the three indicators, then interpreted them with the use of the qualitative data. The student satisfaction survey was completed by eight students, and four took part in the semi-structured interviews. The combined data analysis revealed three overarching themes which we think are vital when creating bMOOCs from existing xMOOCs: quality and quantity of communication and collaboration, significance for career development, and suitability of the MOOC. Tables 2 and 3, and Figure 2 present the results of the three indicators: learning outcomes; engagement with online systems, tools and materials; and satisfaction, respectively. The rest of the results are presented under the overarching themes that were determined as a result of the combined data analysis.

Table 2: Breakdown of grades

Learning Outcomes	Assessment	Number of Students Completed	Weight	Average Class Grade
Define flipped learning (FL)	Flipped 3.0	40	15.00%	15.00%
	RTOL	40	5.00%	5.00%
Illustrate what makes a good FL lesson	Pre-class quiz	36	5.00%	3.67%
	Participation online class	33	5.00%	4.13%
Design a FL lesson	A flipped lesson plan	39	25.00%	18.46%
Evaluate the effectiveness of flipped lessons	Peer-evaluation of video	38	5.00%	4.63%
	Peer-evaluation of FL materials	37	5.00%	4.48%
	Self-evaluation	37	15.00%	10.86%
Produce an effective pre-class video	Create a video	38	10.00%	5.83%
Create online materials	Create online materials	40	10.00%	8.18%

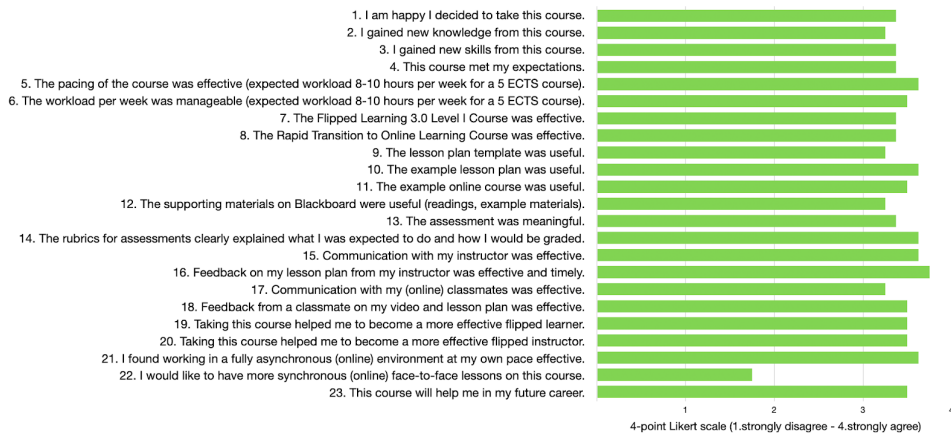


Figure 2: Student satisfaction survey results

Table 3: Engagement with online systems

System	Tool	Graded	Data
MOOCs	Flipped learning 3.0 certification	Yes	100% of students completed
	Rapid transposition to online learning	Yes	100% of students completed
LSM – blackboard learn	Announcement	No	37 announcements in 14 weeks
	Discussion board	No	Not used
	Example lesson plan & Template	No	Data was unavailable on LMS due to timeout
	Additional Readings and Activities	No	Data was unavailable on LMS due to timeout
	Interactive tools	No	Data was unavailable on LMS from third party apps
	Online quiz (for a pre-class quiz)	Yes	36/40 completed with an average grade of 88.4%
	Wikis (for peer-feedback)	Yes	75 entries out of possible 40
	Assignments (for the performance task)	Yes	37 assignments out of possible 40
Virtual Meeting Space – Blackboard Collaborate	Virtual Office	No	Not requested/used
	Virtual classroom – Initial Meeting (Optional meeting space for students)	No	Data was unavailable on LMS
	Virtual classroom – Online Lesson	Yes	33 students
	Student chat room (Session left open during the course)	No	Not used
Communication and Collaboration Tools – G Suite	Emails	No	Around 200 emails over the semester
	Docs and slides (used during the online lesson)	Yes	33 students participated

5.1 Quality and Quantity of Communication and Collaboration

Regarding engagement with online systems, tools and materials, via the LMS, 37 announcements were sent over 14 weeks. One reason for so many announcements at the start was due to students having issues registering to the MOOCs. This could be resolved by having an initial meeting in which students register to the MOOC, which, as Hrastinski [8] opines, would reduce the frustration learners feel when they are unable to ask and answer questions in real time. With the discussion board, in line with Swart and MacLeod [17], the aim was for students to have a place to pose and answer questions. However, it was not used. The instructor noted that she had not set it up in a structured way: *“I simply left it open for students to pose questions if they wished”* (Instructor). One student had a suggestion for improvement: *“This could be developed by adding a feature [...] to discuss [...] with the whole class. If it was mandatory [...] everybody would have to use it”* (Student Three). For quality communication to take place, however, careful consideration needs to go into its purpose and set up. Regarding the virtual office, the instructor had provided the option to offer counselling in line with [17]. However, students opted not to use this, and, in the interviews, all the students expressed that this was because they were happy to communicate via email. The instructor had also set up a virtual chat room to encourage students to work together synchronously, in line with [17]. However, this, too, was not used. The students preferred to use existing modes of communication: *“When I asked the students how they were communicating with each other, some commented that they were using things like WhatsApp to chat with their close friend groups”* (Instructor). However, when it came to using the virtual classroom, 33 students attended. One commented: *“We did one of our classes live [...] I had never seen her live before [...] I think a student knowing their teacher is a good thing [...] I wish she could come to us at least once earlier”* (Student Four). The instructor commented: *“The first live meeting was not successful, as I had not set up a specific enough task for the students. The second was more effective, as I set clear expectations, assessed it, and prepared online group work using Google Docs and Slides [...] From this I learnt that synchronous meetings must have specific tasks and goals that are shared with the students in advance”* (Instructor). This links in with Honeycutt and Glova’s [7] recommendations that instructors find technological tools that allow them to adapt strategies they use in face-to-face classes to engage with their students.

In the satisfaction survey, one hundred percent of students gave a positive response for *“Feedback on my lesson plan from my instructor was effective and timely”*. This was supported by the interviews: *“I had good, descriptive feedback [...] We communicated very efficiently. (My instructor) gave me feedback on my mistakes and answered my questions”* (Student One); *“When we asked questions over email, we got rapid answers. Our teacher always [...] (addressed) every detail”* (Student Two). This supports Conjin, Beemt, and Cuijpers’s [2] opinion that dedicated tutor support

is highly important. All the respondents also said “The example lesson plan was useful”, and 87.5% said “The lesson plan template/example online course was useful”. The instructor concurred: *“I believe most of the students were successful as they had been provided with a lesson planning template, example lesson plan, and example online materials [...] I believe it gave them the structure required to make effective flipped lessons”* (Instructor). These results support the GEEFL recommendation that instructors should give clear directions on how students should approach the learning (Ih C-4). Another area of high student satisfaction was peer-evaluation: 75% of respondents were satisfied with the peer-feedback. This was supported in the interviews: *“Commenting on our classmates’ plans was really beneficial”* (Student One); *“Because [...] we assessed the lesson plans of a classmate (and) offered feedback [...] we learned about the mistakes other people made as well as getting feedback from classmates on our own work”* (Student Two); *“Seeing how other students perceived it and did things is very educational in my opinion”* (Student Three). These results support Swart and MacLeod’s [17] recommendation that instructors encourage students to work together asynchronously to give feedback on each other’s work as well as DeVita, Lanier, Parker, Boersma, and Hicks’s [3] recommendation that strategies are applied that involve active engagement and critical reflection. Another aspect with high satisfaction was the asynchronous environment. Eighty-seven percent said *“Working in a fully asynchronous environment at my own pace was effective”* and 75% expressed they did not want an increase in synchronous lessons. However, the instructor had some concerns: *“For students who are autonomous and want to move ahead at their own pace, this is a better environment. But, for students that struggle with their time-management, this is more challenging”* (Instructor). This echoes Milligan and Littlejohn [12], who worry students may lack self-motivation if there is not enough dedicated tutor support. For example, in the current course, one area where students needed more tutor support was creating videos; for this outcome, there was a low average grade of 53% even though the overall video grades were good. The low average was due to three students not creating a video. The instructor believes this might be due to fear of using new technologies and, in future iterations, will provide more support in this area.

5.2 Significance for Career Development

Thirty-six students out of 40 passed, making the pass rate for the course 90%. The average grade was 83.57%, meaning achievement of learning outcomes was successful. This was also seen in the student satisfaction survey. 87.5% of respondents said *“Taking this course helped me become a more effective flipped learner/instructor”*. This supports Hung, Chih-Yuan Sun, and Liu [9] that MOOC-based flipped learning can enhance students’ learning motivation and outcomes. For MOOC certification,

all 40 students completed both MOOCs. All participants said they were motivated by the certificate. This supports Hew and Chung [6] that students are motivated by completion certificates. Students were also happy with the end-of-course task. 87.5% said *“it was meaningful”*. There were also references in the interviews regarding how this course could assist the students in their future careers: *“This course helped me learn new information and apply and experience what I learnt. The assessment helped me learn valuable information I will use in the future when I am a” teacher (Student One)*; *“It provided me with good things that can help my career. I’m someone who thinks flipped learning is a really” effective method. It saves on so much class time and this is used more effectively (Student Two)*; *“I want to apply it in my own work and aim to be a flipped teacher.” (Student Three)*; *“When job hunting, I plan to say ‘I’m a teacher who knows flipped learning’. I plan to market myself using (this)” (Student Four)*. This supports Milligan and Littlejohn [12] that MOOCs can benefit participants’ future careers, and Gamage, Perera, and Fernando’s [4] opinion that MOOCs are effective in meeting users’ learning goals.

5.3 Suitability of the MOOC

There is evidence from the student interviews that some students fully engaged with the certification MOOCs: *“I didn’t know that those two certificate programs I did were this intense before engaging with them. By that I mean how fully formed they are” (Student Four)*. However, as one student pointed out, gaining the certificate was relatively easy: *“At the end of the units [. . .], there were tests (which) could be taken an infinite number of times [. . .] There is no risk of getting a bad grade [. . .] You could just get back to the video needed to answer a particular question” (Student Two)*. While the tests in the Flipped Learning Level I MOOC are, in fact, designed to encourage students to go back and watch the videos again if they have not understood, as Student Two identified, it was possible for students to simply click through, get incorrect answers, and still get the certificate. In this case, the grading in the Flipped Level I MOOC may not be suited to the purpose intended by the instructor. This could be overcome by moving MOOC quizzes to the LMS. For “design a flipped learning lesson” outcome, grades were much lower than for other assessments. The instructor put forward a suggestion as to why this was the case: *“The least successful students did not complete the FLGI MOOCs before writing their lesson plans. They should have registered on 10th February, but four students sent mails at the end of April about this, meaning they attempted to create their flipped lessons without participating in the online instruction” (Instructor)*. This supports Kloos, Munoz-Merino, Alario-Hoyos, Ayres, and Fernandez-Panadero’s warning that getting students to complete the online activities before classes is challenging. In addition, for these students, as observed by [2], bulk learning instead of paced learning had a negative effect

on their success. The instructor had tried to avoid this by designing the course, following [13] so that it had an appropriate activity distribution for the topics and activities, and by pacing learning, following [2] by adding recommended start dates to each unit. However, these were guidelines only. Students were only held accountable for completing the assessments by the set deadlines.

6 Discussion

The results indicate that high student achievement and satisfaction can be achieved by using xMOOCs as the content for a university course. However, the results also indicate that utilizing xMOOCs for an online course requires a lot of attention in how the students will engage with the materials and each other via the online systems, and how and when materials should be accessed, areas in which the current course needs to be improved on. Drawing on the three themes that were developed, the authors put forward the following framework and guiding questions for the development of effective xMOOC-based online courses (Figure 3).

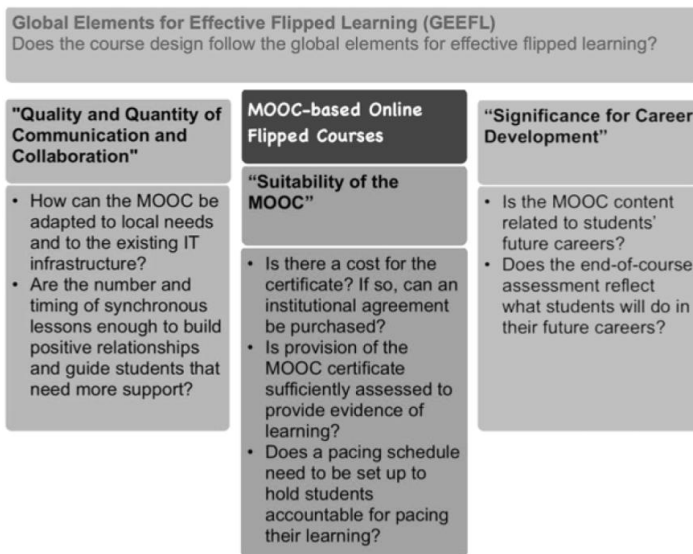


Figure 3: Framework for the development of MOOC-based flipped courses

“Quality and quantity of communication and collaboration” is critical to keep students engaged with the instructor and their classmates and for learning to take place online. For this to happen, the MOOC must be adapted to local needs. It should also link in with the existing university IT infrastructure. Moreover, a synchronous lesson at the start of the course should be held to build a positive relationship between the instructor and students and to ensure students have registered to the MOOC. In terms of “Significance for career development”, quantitative data also showed students found the MOOC relevant for their future careers. One of the reasons may be that the students, all faculty-of-education teacher candidates, had specifically chosen the FLGI MOOC to support their future careers. The system used at our institution supports this, as it is the students that choose the MOOC. Moreover, the content of the MOOC proved suitable for this. Another reason for this came out in the interviews; the students found the performance task relevant, which, using backwards design, had asked them to design a lesson originating from a real-life problem, in which they had to apply the information and skills they had gained in an authentic way. Thus, for significance for career development, not only is the MOOC content important, but it is also imperative that there is an authentic assessment task that supports students’ future careers. “Suitability of the MOOC” emerged as a critical factor for pacing learning and motivating students. However, if a freemium version is used, the certificate may not be available for students, which may diminish student motivation to complete the MOOC. One way around this may be for universities to get an institutional agreement with xMOOC providers and incorporate the cost into tuition fees. This is an additional expense at a time when many universities are facing a funding crisis. However, if universities require ready-made materials to keep their education online during the pandemic, the expense is worthwhile. In fact, in January 2021, this is exactly what MEF University did when it signed institutional agreements with LinkedIn Learning and edX. MEF was also the first university in the world to integrate edX into its learning management system, Blackboard. The second issue with freemium xMOOCs is there is no way the instructor can check if students have completed the activities. This can be circumvented by the instructor creating graded quizzes about the MOOC content on the university LMS. This overcomes the lack of evidence of learning from the MOOC, as well as holding students accountable, and may also support less autonomous learners who need more structured pacing, but is time intensive for the instructor.

7 Conclusion

From the results, we believe the MOOC-based Flipped Learning in Education course, mostly conducted during the emergency campus closures, was effective for student achievement of learning outcomes and satisfaction. Yet, there is room for improvement regarding engagement with online systems. From the findings, the authors put forward a framework and guiding questions for the development of effective MOOC-based online courses. We believe this evidence-based framework is useful not only for institutions and teachers that are already considering developing courses from existing xMOOCs but also for institutions that need to rapidly transition to online learning. Furthermore, we believe that such a course design for universities can benefit their students' career development by integrating micro-credentials into the curriculum, fostering learner choice and autonomy, and bringing flexibility in delivering quality instruction in times of uncertainty.

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