4-18-2022

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Publication Info

Published in *Cogent Education*, Volume 9, Issue 1, 2022.

Cogent Education

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/oaed20

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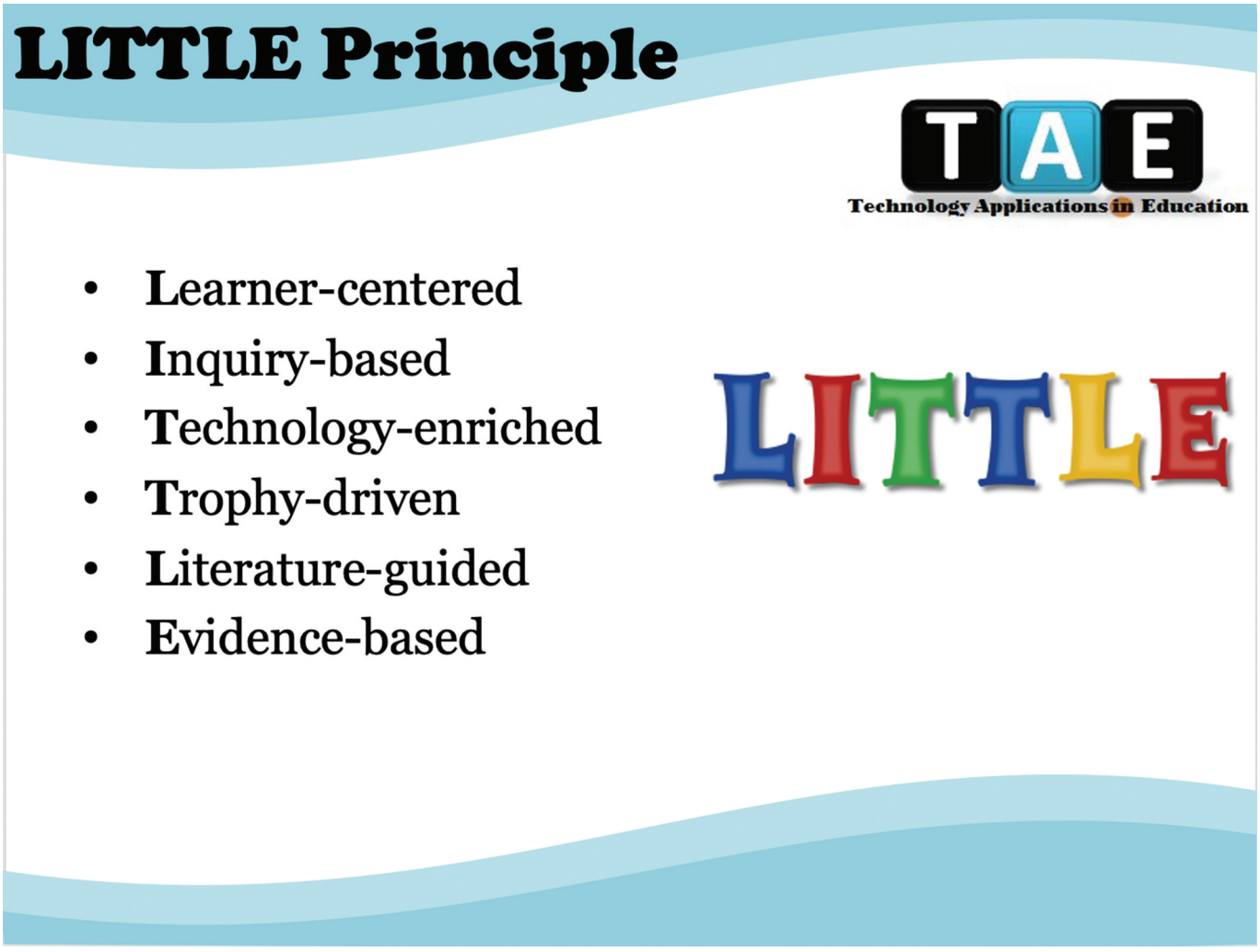
To cite this article: Hengtao Tang & Yingxiao Qian (2022) Designing MOOCs with LITTLE, Cogent Education, 9:1, 2064411, DOI: 10.1080/2331186X.2022.2064411

To link to this article: https://doi.org/10.1080/2331186X.2022.2064411

Published online: 18 Apr 2022.

cogent education



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Cogent Education (2022), 9: 2064411

Tang & Qian, *Cogent Education* (2022), 9: 2064411
https://doi.org/10.1080/2331186X.2022.2064411

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INFORMATION & COMMUNICATIONS TECHNOLOGY IN EDUCATION | RESEARCH ARTICLE

Designing MOOCs with LITTLE

Hengtao Tang[1]* and Yingxiao Qian

Abstract: Massive Open Online Courses (MOOCs) have been touted as a disruptive innovation with a low-cost and flexible option for opening up higher education. However, existing barriers of MOOCs such as a low retention rate and a low forum participation rate have limited their capacity of serving learners. To strengthen the potential of MOOCs, a compelling design that enables an effective learning experience is needed. This article is aimed to propose a series of design guidelines for MOOCs, namely the LITTLE, as a preliminary design framework for an effective MOOC. The LITTLE includes guidelines such as learner-centered, inquiry-based, technology-enriched, trophy-driven, literature-guided, and evidence-based strategies. Examples are provided in concert with theoretical justifications to illustrate the guidelines.

Subjects: Open & Distance Education and eLearning; Design & Delivery; Teachers & Teacher Education

Keywords: MOOCs; instructional design; distance education; guidelines; LITTLE

Received: 02 March 2022
Accepted: 29 March 2022

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Reviewing editor:
Shuyan Wang, Instrcution, The University of Southern Mississippi, Hattiesburg, Southern Mississippi, United States

Additional information is available at the end of the article

1. Introduction

Over the last few years, MOOCs have seen an increasing proliferation as a disruptive educational innovation with the potential of removing the restrictions on learners' access to higher education (Tang & Carr-Chellman, 2016; Tang & Wang, 2019). MOOCs provide unlimited worldwide learners

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PUBLIC INTEREST STATEMENT

Massive Open Online Courses (MOOCs) are the latest incarnation of online courses that allow a large number of learners to access higher education resources at no cost. MOOCs can potentially open up higher education to those who otherwise cannot access it; however, to date, MOOCs have been challenged by a low retention rate and a low participation of enrolled learners in learning activities. This article aimed to propose a series of design guidelines that may help MOOC designers and instructors to improve the effectiveness of learning experience in MOOCs. The LITTLE, was thus proposed in this article.
A synthesized account of the LITTLE guidelines, an acronym for learner-centered, inquiry-based, technology-enriched, trophy-driven, literature-guided, and evidence-based, is presented with specific examples. Online course instructors and designers investing in distance education may find those guidelines applicable to their design practices.

an open access to higher education without any additional charges or prior qualifications (Littlejohn et al., 2016), especially when global higher education systems are firmly challenged by the escalation of tuitions (Perna et al., 2014) and unequally distributed educational resources (Rohs & Ganz, 2015). MOOCs bring the hope of further promoting educational equality, and thus governments and markets have invested in the adoption and diffusion of MOOCs. For example, MOOCs have been increasingly integrated as a low-cost, flexible option for teacher education and professional development. MOOCs can provide teachers worldwide with a wide array of course options to facilitate their professional growth and also participate in professional development without any time and location constraints. In addition, higher education institutions have integrated MOOCs as a part of hybrid or online certificate programs for employed professionals to improve their skillset and credentials (Tang & Xing, 2022).

However, it should be noted that MOOCs performance is far less equitable than expected, and a transition from the hype to the disappointment appears to be underway, due to several unresolved problems with regard to the inferior learner performance, such as low course completion rates (Tang & Wang, 2017) and sporadic learner forum participation (Anderson et al., 2014; Brinton et al., 2014; Brown et al., 2015; Tang et al., 2018, 2019). MOOCs bring together massive numbers of learners with significant variance among their life experiences and sociocultural beliefs (Gillani & Eynon, 2014). Online learners enroll in MOOCs for various reasons, which affect their tendency to engage in learning activities and complete a MOOC (Milligan & Littlejohn, 2016). In addition, the student-to-teacher ratio in a MOOC is dramatically high which means a majority of learners almost never receive personalized feedback from the instructor (Tang & Carr-Chellman, 2016). Unfortunately, in the event that learners fail to understand the content, they may find it harder to receive immediate support from either the instructor or their peers as that in face-to-face classroom settings. Those struggling learners might disengage from the course if things continue in this way.

Therefore, the purpose of this article was to identify effective design guidelines for MOOCs in order to overcome existing constraints of MOOCs. The LITTLE guidelines, including a series of design guidelines such as learner-centered, inquiry-based, technology-enriched, trophy-driven, literature-guided, and evidence-based, were proposed based on the evidence from the existing literature. To illustrate the LITTLE guidelines, the following sections will first provide an overview of the significance of MOOCs for the current education landscape and also the existing barriers to fulfilling the educational potential of MOOCs. Then a synthesized account of the LITTLE guidelines supported with a specific example is presented. MOOC instructors and designers investing in distance education may find those guidelines applicable to their design practices.

2. Literature review

2.1. MOOCs: The promise of opening higher education

MOOCs have earned increasing prominence in the educational field with their potential of providing a virtually limitless number of learners with an affordable and open access to higher education (Rambe & Moeti, 2017). Traditionally, universities imposed strict restrictions toward would-be learners and limited the population for enrollment. Especially recently, learners have had to wrestle with the increasing cost of attending higher education (Perna et al., 2014). To date, the unequal access to higher education has become a major challenge for personal and social development (Rohs & Ganz, 2015). The rapid development of the Internet has generated abundant information available to learners and, in turn, the abundance of information enlarged societal needs for knowledge, which has challenged the privilege of academic knowledge possessed by universities (Brown et al., 2015; Rohs & Ganz, 2015). The term “Massive Open Online Courses” was proposed in 2008 after George Siemens and Stephen Downes facilitated what was generally considered to be the first MOOC, Connectivism and Connective Knowledge (CCK08), making the course available to worldwide learners (Downes, 2008). MOOCs responded to the uneven access and high cost of higher education, by enabling worldwide learners to register for free in prominent,

college-level courses, and were briefly identified as a panacea to higher education (Brown et al., 2015). In 2012, MOOCs received a great deal of attention and were well remarked by an unprecedentedly large population on media. This year was subsequently named "The Year of MOOC" (Pappano, 2012).

The advocates were thrilled by the potential of MOOCs as a disruptive innovation (Tang & Carr-Chellman, 2016) making statements such as "nothing has more potential to lift more people out of poverty by providing access to an affordable education for employment" (Friedman, 2013). Consequently, the advocates invested enormous efforts in numerous initiatives of MOOCs to "democratize" or "revolutionize" higher education (Hood et al., 2015). Those initiatives pertaining to MOOCs were provided upfront investment and policy support from governments, organizations, institutions, and venture capitalists across the world. More recently, Coursera is one of the largest providers, and received a third round of investment funds up to 50 million dollars, and Udacity, another giant MOOC provider, was provided a venture investment of more than 100 million dollars in 2015.

In the meantime, the diffusion of MOOCs has reached far more than expected. MOOCs originated in North America, but the wave of MOOCs gained worldwide popularity. For example, the Chinese government is dedicated to fostering a "learning society" and has embarked on a nationwide top-down effort to adopt MOOCs as an integral pathway to fulfil the blueprint (Tang & Bao, 2020, 2021; Zhang, 2015). In Europe, the European Association of Distance Teaching Universities (EADTU) led the initiative of "pan-European MOOCs" with partners from eleven countries within the European Union (Jansen et al., 2020). In addition, a large number of universities have joined this wave and launched their own MOOC courseware to enroll increasingly massive numbers of learners in their online courses which otherwise were only accessible to those who were accepted to attend their brick-and-mortar campus (Zhang, 2015).

In summary, MOOCs assume the hope of democratizing education with the potential of providing an open and free access for massive numbers of enrollments to higher education resources. Thus, MOOCs have gained increasing attention worldwide in the educational field, especially in such an era when an equal access to higher education has become necessary for both individual and social development (Rohs & Ganz, 2015). A large amount of upfront investment has been dedicated to the growth of MOOCs. However, there are increasing voices chorusing their concerns about whether MOOCs will be able to fulfill their educational potential without addressing some unresolved problems. To reinforce the success of MOOCs, it is necessary to be aware of the existing barriers that challenge the development of MOOCs and to seek solutions.

2.2. MOOCs and the existing barriers

To date, it has been not certain whether MOOCs will be able to fulfill their primary promise of providing the opportunity to learn and grow for unlimited people (Tang, 2021b). For example, the low retention rate manifested as the scale-efficiency tradeoff (Xing et al., 2019) has incited doubts about the quality of MOOCs. Another significant issue may also contribute to the low completion rates. Active forum participation is central to the learner success in MOOCs (Tang et al., 2018, 2019; Wang et al., 2015), but a majority of learners are infrequently engaged in the discussion forums and associated activities probably due to the fact that the forum participation is not graded (Margaryan et al., 2015). In contrast to the alluring potential of enrolling a massive number of learners, educators and researchers are more concerned with the relatively inferior learner performance in MOOCs. MOOCs are not as progressive as expected and even confront the risk of waning. Reference (Gouseti, 2010) used the "hype, hope, and disappointment" cycle to characterize the fast-changing alternation of online innovations and proposed that this online innovation confronted the risk of shifting from the hype to the disappointment if their designers fail to identify the best practices to maintain the innovativeness. Some critics labelled MOOCs as a "has-been" because they insisted the peak of MOOCs had gradually vanished (Salinas et al., 2015). This calls for more thorough and elaborate investigations by educators and researchers to identify the

existing barriers to the growth of MOOCs and to further seek potential solutions to resolve these barriers. The section provides an overview of the problems associated with the low level of learner performance in MOOCs, such as the high attrition rate and the infrequent learner forum participation.

2.2.1. Low completion rates in MOOCs

The high attrition rate generates plenty of doubt about the quality of MOOCs (Tang, 2020, 2021a). Thousands of online learners can enroll in the same course, but only less than 15% of them generally satisfy the requirements required for completion in the end. The significance of students' persistence and attrition in evaluating the quality of higher education programs has been well investigated in prior research. For example, Reference (Tinto, 1975) proposed a conceptual model of college students' attrition that highlights dropping out as a process jointly determined by both personal commitment and institutional factors. Following the framework in (Tinto, 1975), numerous researchers have investigated personal and contextual factors that contributed to learner attrition in MOOCs with the hope of identifying implications that would support learner success in this setting (Gillani & Eynon, 2014; Hew & Cheung, 2014; Hood et al., 2015; Kizilcec et al., 2017, 2013; Milligan & Littlejohn, 2016).

Several personal factors, such as the purpose behind learners' enrollment in a MOOC as well as the level of their prerequisite knowledge and their time management skills, can influence whether learners satisfy the requirements of course completion (Gillani & Eynon, 2014; Hew & Cheung, 2014; Kizilcec et al., 2013). For example, online learners enroll in MOOCs for four major reasons, including extending personal knowledge in a subject, earning a certificate or qualification, curiosity about online learning, and fun and entertainment (Kizilcec et al., 2013). Accordingly, learners' performances are radically different in terms of their goals and those who register a MOOC for the goal of earning a certificate from the course have a stronger tendency to stay engaged until the completion of a MOOC (Milligan & Littlejohn, 2016). To the contrary, learners who are interested in a certain section of the course or merely desire to probe into the online learning experience might just view the lectures and end up disengaging from the course before completion (Kizilcec et al., 2017; Perna et al., 2014). In addition, there is a large variation in the level of the prerequisite knowledge between learners given the diversity of their backgrounds (Tang et al., 2016). Even those without prerequisite knowledge and skills are also allowed to register for a MOOC, but the mastery of subject knowledge is not guaranteed for those learners without basic prior knowledge (Kizilcec et al., 2017). As the course proceeds, the failure to understand course content can be a significant factor that increases the inclination of learners to drop out of the course (Hew & Cheung, 2014). Furthermore, learners' incompetence in time-management leads to attritions (Kizilcec et al., 2017). It is usually time-consuming to follow the course schedule and complete the weekly activities in a MOOC. For those with additional full-time occupations or formal school responsibilities, the limited available time devoted to MOOCs surely competes with the desire or need to maintain their retention in this course (Fini, 2009).

On the other hand, some contextual factors in MOOCs might also result in what appears to be a large number of "dropouts" in MOOCs. MOOCs are open to massive throngs of diversified learners with various motivations and different levels of prerequisite knowledge to take the course (Hew & Cheung, 2014). However, relatively less supportive environments are also a cause of the low completion rate of MOOCs (Kizilcec et al., 2017; Milligan & Littlejohn, 2016). For example, MOOCs are characterized by a low level of personalized support and feedback from instructors, but in the meantime, learner-instructor interaction is a significant predictor of course retention in MOOCs (Tang & Carr-Chellman, 2016), The student-to-teacher ratio in a MOOC is dramatically large which means a majority of learners almost never receive personalized feedback from the instructor. Unfortunately, in the event of failing to understand the content, learners find it hard to receive the immediate support from either the instructor or their peers they might find in face-to-face classroom settings and they might disengage from the course if things continue in this way. Additionally, learning in MOOCs is not normally driven by tempting incentives such as grades

and degrees, unless learners are intrinsically keen on the topic or have strong desire for and the ability to pay for a MOOC certificate (Hew & Cheung, 2014). MOOCs provide certificates for course completers, but unlike official diplomas from traditional schooling, those certificates are still not well accredited by the talent market, nor are they recognized as credits towards a degree (Tang & Carr-Chellman, 2016). Moreover, MOOCs afford more autonomy for learners to follow their personal commitments (Littlejohn et al., 2016). With a flexible course structure, learners can drop out of a MOOC at their discretion should they lose the intrinsic interest.

In conclusion, numerous factors, both personal and contextual, pose significant challenges reducing the probability of completion for MOOC learners. In particular, they have to be intrinsically motivated to take the course in a less supportive environment and also capable of actively regulating the learning process until the completion of MOOCs.

2.2.2. A lack of forum participation in MOOCs

In MOOCs, it is unlike that the level of instructional feedback and supports typically found in the traditional college-level courses will be provided, due to a much larger number of enrollments and the absence of tuition-based revenue to fund such supports (Tang et al., 2018). Without constantly available instructional support, learners might wrestle with such challenges as difficulties in understanding the content, and the challenges might even lead to the dropout of MOOCs. In theory, interactions on the discussion forums are expected to proliferate in MOOCs, in an attempt to compensate for the lack of instructors' support for learners. The significance of learner participation in discussion forums for their performance in the MOOC course is evidenced. Engaging learners in the discussion forum becomes one of the key priorities to enable large numbers of learners to thrive in MOOCs.

However, research indicates a minimal number of learners participate in the interactions within the discussion forums (Gillani & Eynon, 2014). Discussion forums in MOOCs are not the same as those used in traditional online courses because they have a looser structure (Milligan & Littlejohn, 2016) and are not included in the course assessment (Gillani & Eynon, 2014; Margaryan et al., 2015). Accordingly, learners' participation patterns in the discussion forums vary remarkably in terms of the time and the effort invested. For instance, some learners devoted more extensive efforts to engaging in the discussion forums than watching lectures (Seaton et al., 2014). Contrarily, reference (Hew, 2016) analyzed learner engagement in different MOOCs and found most learners are more focused on viewing course lectures but seldom working on the assignments or participating in the discussions. In addition, the pattern of learner forum participation in MOOCs gradually decreases. Many learners intended to complete the course at the beginning, but as course schedule proceeds, they gradually disengage from the course and might seldom participate in the discussion forum (Wang et al., 2015). For example, learners might feel overloaded to read through a seemingly endless number of posts from large numbers of learners and then terminate their participation in forum activities, especially as more and more posts are increasingly seen in the discussion forum (Brinton et al., 2014).

Overall, participation in discussion forums is integral for learners to complete a MOOC, especially given that instructional feedback and supports are relatively limited in this setting (Tang et al., 2018). However, participation in discussion forums is seldom included in the assessment of MOOCs (Gillani & Eynon, 2014; Margaryan et al., 2015). Furthermore, due to the large number of enrollments in MOOCs, reading through all forum posts become increasingly overwhelming for learners as the course proceeds. Therefore, the significance of actively engaging online learners in discussion forums and associated activities accentuates the need for online learners to exert self-regulated learning skills while completing a MOOC course.

2.3. Design strategies for MOOCs

To sustain the effectiveness of MOOCs, researchers have embarked in search of design strategies to deliver these form of courses. MOOCs are the latest incarnation of online courses that embrace

a learner-centered pedagogical belief (Tang, 2018). Blum-Smith et al. (2021) reviewed facilitator actions that may allow course instructors and/or facilitators to enact their learner-centered pedagogical aspirations, such as allowing students with autonomy and provide explicit content and feedback. In addition, active learning strategies, such as inquiry-based learning strategies that allow students to follow a design process from identifying a gap, devise a solution to craft an artifact, may prompt student engagement in MOOCs (Hew, 2016). Furthermore, learning in MOOCs is a self-regulated process wherein learners need to have strong self-regulated learning skills or receive efficient interventions in order to maintain their engagement (Tang, 2021b). For example, badges and professional certificates have been widely used as rewards to encourage learners, especially professional learners, to register and complete MOOCs (Tang, 2021c; Tang & Xing, 2022). Although reward-based strategies did not significantly increase student retention and engagement in MOOCs, the opportunity to earn badges and redeemable rewards (e.g., access to additional resources or assessments) prompted learner participation in gamified tasks (Ortega-Arranz et al., 2019). Furthermore, course interactions in the form of learner-learner, learner-instructor, and learner-content interactions are a significant predictor of student success in MOOCs (Blum-Smith et al., 2021; Hew, 2016). Affording an effective interaction experience for learners is thus prioritized for designing MOOCs. For example, MOOC instructors have enabled discussion boards and some external tools such as social media groups and blogs to maintain and even expand learner-learner interaction in MOOCs (Tang, 2021c). To facilitate learner interaction with course content, Hew (2016) recommend that providing an easy-to-follow structure and content improved student engagement in MOOC content. Though learner-instructor interaction is relatively more scarce than that in traditional courses, MOOC instructors are recommended to maintain an active instructor presence by sending out weekly emails and providing prompt feedback (Tang et al., 2016) Moreover, evidence-based assessment, including formative and summative assessment, is an important factor matters for the effectiveness of MOOCs (Prieto-Rodriguez et al., 2016). Overall, researchers have identified various strategies to improve MOOC course design in order to increase learner retention and prompt their participation in course activities and forums. To implement those strategies in MOOC design, a systemic framework of guidelines about how to enact those strategies in teaching and facilitation is needed. Therefore, this article intended to propose a series of MOOC design guidelines based on existing evidence from the literature.

3. The LITTLE guidelines

This section proposes the LITTLE as a preliminary framework of design guidelines for MOOC instructors and designers to design MOOCs. The LITTLE guidelines included six key features built into the course design, including Learner-centered, Inquiry-based, Technology-enriched, Trophy-driven, Literature-guided, and Evidence-based. To illustrate each feature of the LITTLE, a Canvas MOOC design example, *Technology Applications in Education*, was provided in concert with relevant theoretical underpinnings. The rest of this section will focus on the introduction of the LITTLE guidelines.

3.1. Learner-centered

Affording learner-centered experience in MOOCs should ensure that learners can self-determine their goals and learning paths respectively (Blum-Smith et al., 2021). Research has indicated that a large scale of enrollment and openness amplified the opportunities for MOOCs to deliver a learner-centered experience (Blum-Smith et al., 2021; MacDonald & Ahern, 2015). It is important to understand learners' individualized goals in the course, so a pre-course survey inquiring about learners' expectation about the course is necessary. After identifying learners' needs, the course needs to offer a variety of options for learners to choose their preferred way to meet their goals (Blum-Smith et al., 2021). Therefore, an effective MOOC design needs to provide learners with multiple options to address their individualized needs in the course. For example, MOOCs may open up the channel for learners who prefer completing the course by primarily reviewing course content individually (Tang & Xing, 2022). To address this need, MOOC designers may provide an easy-to-follow structure and guidance to reduce any barriers for individual learners (Hew, 2016). Also, learners from various countries or regions may have different conditions of

infrastructures to attend a MOOC so providing learners with course materials in various formats is helpful. For example, course materials may be delivered in both videos and text-based documents to mitigate the barriers for learners from a relatively resource-constraint area to access the materials. In addition, other learners may choose to benefit from diversified interactions with peers (Brinton et al., 2014). Effective learner-learner interaction experience is thus needed by means of group works, peer assessment, and community building (Brinton et al., 2014; Margaryan et al., 2015; Tang et al., 2018). On the other hand, with a relatively loose structure in MOOCs, learners can determine when to withdraw from the course without any penalty (MacDonald & Ahern, 2015). It is thus important to identify at-risk learners early and provide scaffolds to help those learners stay engaged. Learner-instructor interaction via weekly announcement, virtual conferencing, or assignment reminders may help fulfill this need (Tang, 2021c).

3.1.1. Example

The purpose of this Technology Applications in Education MOOC was to improve K-12 educators' expertise of integrating educational technology into their teaching practice. The course built a learner-centered design by understanding learners' needs and enabling self-determined options for learners to meet their goals. Enrolled learners were asked to complete a survey to share their goals and expectations about taking this course. The design team thus analyzed the preliminary data and incorporated the changes necessary for each learner to learn effective. To address the strength of a connected community of K-12 educators, discussion forum and peer-review assignments were included in the course so that those who prefer learner-learner interaction can benefit from this setting and those who preferred interactions with the content and the instructor can also participate in the discussion and expand their insights. In addition, the instructors sent out weekly announcement and asisgnment reminders as well as hosted a video conferencing session to address individualized needs of a world-wide audience.

3.2. Inquiry-based

Inquiry-based learning in online settings has yielded fruitful works such as community of inquiry (Garrison & Akyol, 2013) framework that has been widely used in online courses to strengthen learners' inquiry-based learning. For MOOCs, affording inquiry-based learning is also important for learners to develop transferrable knowledge that can be used to address their practical problems (Al Mamun et al., 2020). Project-based MOOCs (Reeves & Hedberg, 2014) have been proposed as a useful model for learners to seek a problem of practice relevant to their own interests and participate in a series of inquiry practices to solve the problem. This format created a strong link between learners, knowledge, and their contexts so that learners could link their subject knowledge into course activities and further develop a project that can be used in their real-life work or learning contexts. However, as learners in MOOCs differ by their level of knowledge and experience about the topic, providing learners with scaffolds such as explicit tutorials or sample projects may help them overcome barriers and complete the course.

3.2.1. Example

Based on K-12 educators' practical needs, the Technology Applications in Education course empowered enrolled learners to work on individual projects to address practical needs in their teaching practices. Specifically, enrolled learners were tasked with designing an online course that they could implement in their real-life teaching practices. Learners built a website from scratch, created various multimedia products, and developed an integration plan to integrate the course in their teaching through five week-long modules, each of which was themed in a specific topic. Learners also inserted self-created multimedia products in the website aligned with their needs.

In addition, the course provided explicit step-by-step tutorials that learners might refer to when creating multimedia artifacts. For example, the course previously only included video lectures and their textual based alternatives, but step-by-step tutorials for using each tool such as Weebly and Voki were missing. After inquiring learners' technological skills and course expectations, the course team created explicit step-by-step tutorials for each of the tools discussed in the course, making them available in both video and textual versions.

3.3. Technology-enriched

The effect of technology integration on learning in online settings has been evidenced. MOOC platforms usually provide flexible options for instructors to integrate technological innovations or products in order to facilitate student learning. A technology-enriched context can help increase learner engagement and improve the course interactivity (Kopcha, 2012; Tang, 2021a; Tang et al., 2020). For this feature, cautions are needed to avoid overwhelming learners with new tools and to provide support such as explicit tutorials for enrolled learners.

3.3.1. Example

The Technology Applications in Education MOOC integrated multiple perspectives of emerging technologies, including mobile learning, digital badges, and multimedia products, to provide K-12 educators with a technology-enriched learning environment. The use of technology applications helped create an engaging and ubiquitous learning experience. In addition, the integration of technology enabled K-12 educators, especially those who were keen on educational technology and innovation, to upskill and enhance their capacity of technological integration in their classrooms.

3.4. Trophy-driven

Trophies in educational settings usually include certificates, credits, and badges. In particular, digital badges or micro-credentials are a digital format of content-focused certificates that ascertain an individual's competence in a specific skill or set of skills (Kohler et al., 2021). MOOCs provide a new avenue for educators to improve their professional competence that can be accredited by higher education institutions and organizations. For example, educators can apply for certificates of completion for MOOCs that they completed and also earn digital badges or micro-credentials for a specific skill that they obtained. Therefore, MOOC instructors and designers may consider structuring learning modules aligned with the trophies provided in a MOOC in order to foster learner engagement in the course (Ortega-Arranz et al., 2019). For example, MOOC instructors and designers can embed digital badges or micro-credentials in a smaller learning units such as a weekly module or a key assessment project. In addition, game mechanics (Aparicio et al., 2019) may be embedded in the course design that allow learners to unlock a new unit on the basis of completing an existing challenge. However, it is important to provide explicit rubric for the assessment of artifacts so that learners can tailor their submission to meet the requirements of the rubric.

Figure 1. The badge for MOOC learners who completed Technology Applications in Education.

3.4.1. Example

The Technology Applications in Education MOOC integrated game mechanics and uses digital badges to motivate learners. Each of five modules was closely correlated in course content. Learners would be issued a badge if their submission of works qualified the criteria outlined in the rubric. The course also included a meta-course badge (see, Figure 1) at the end of the last unit which required learners to collect all four sub-badges in previous modules to be qualified for the meta-course badge.

3.5. Literature-guided

Teaching educators to design online courses following well-justified learning theories is critical to improve the effectiveness of online courses. Most of MOOCs are mainly focused on practical skills or competences for teachers, but adopting a literature guided format is necessary. Some learners enrolled in a MOOC may have no education background or a basic understanding of educational theories (MacDonald & Ahern, 2015). It is thus necessary to start with a review on relevant theoretical works or literature that is well-grounded in learning theories. Before working on technological practices, learners need to be equipped with related theory to promote their understanding of the content and further improve their technological practice, especially for those learners who are novice to educational or pedagogical theories.

3.5.1. Example

This Technology Applications in Education course was closely connected to learning theories. At the beginning of each unit, the course provided a review of theoretical works to help learners construct solid understanding of the topic. For example, the first orientational module began with a review of readings on the ADDIE model and other different types of instructional design models for learners to be competent for the assignments in that module and set up a strong foundation to complete the course. This literature-guided format also hopefully brought new inspirations to enrolled learners, especially those who were K-12 educators, to reflect their learning and teaching practices in line with learning theories.

3.6. Evidence-based

An evidence-based approach (Prieto-Rodriguez et al., 2016) is recommended for MOOC instructors and designers to design and develop MOOCs. A needs assessment may help inform the gap between what educators need and what the current professional development opportunities fail to provide for them. It is also necessary to involve multiple stakeholders' voice, such as teachers, school leaders, and instructional designers, to implement the evidence-based approach. In addition, MOOC instructors and designers may tailor course assessment to the competence embedded in the course. This can provide course instructors and designers with supplementary data that informs them of revisions and improvements made to the future deliveries of the course. In addition, formative assessment is also needed in designing and delivering an effective MOOC. MOOC instructors and designers may consider embedding mid-course and/or end-of-course evaluation surveys and conducting exit interviews to collect valuable insights from enrolled learners to improve the MOOC design.

3.6.1. Example

The Technology Applications in Education MOOC adopted an evidence-based approach to design the course. Focus group interviews with teachers and instructional designers were conducted to assure the gap in teachers' needs to teach online and their lack of relevant expertise in designing, developing, and implementing online courses. An instructional designer worked with the course instructor to analyze the needs and produce the course materials accordingly. In addition, pre-coruse survey was conducted as aforementioned to understand learners' expectations of this course and make necessary adjustments to course content and schedule. Furthermore, exit interviews and end-of-course surveys were performed to collect learners' perception of the course and recommendations for revisions and improvements for future offerings. Several sample quotes from the exit interviews were included below.

> I think your course is very well-designed. Coherent because Objective of the course is coherent with the content. The other difference is that the teacher is real, effective in providing knowledge and how we are doing these things.

I want to find out even more new apps & new techniques. My goal is to have such experience that I can put in the resume or LinkedIn to get a new job

Maybe a little bit more choices of assignments. for me, I do not want a blog. For the video (production assignment), could I do with the GarageBand?

I was not interested in badges but in learning. When you sent the first badge, I thought it was relevant to have it. I do have in my backpacks. It is interesting to show people you can learn even though you are old. That's the thing.

3.7. Conclusion

This article proposed LITTLE design guidelines as a preliminary framework for MOOC instructors and designers to design, develop, and facilitate an effective MOOC. The LITTLE was proposed in line with learning theories with a focus on affording a learner-centered experience and supporting inquiry experience in MOOCS. In addition, the guidelines prioritize the need to immerse enrolled learners in a technology-enriched context so that learners, especially those K-12 educators, can model technology integration practices in their own online courses. Furthermore, MOOCs feature a relatively loose course structure so trophies such as course certificates and digital badges are needed to help learners stay engaged in the course. It may create an even more engaging experience for learners if MOOC instructors and designers can embed game mechanics in the course that requires learners to complete a certain unit or obtain a certain skill or competence before they can unlock a new challenge. In addition, despite a primary focus on practical skills and competence in MOOCs, preparing enrolled learners with an essential understanding of relevant theories in a literature-guided manner is important. For example, MOOCs may start with an introduction on relevant theories or models so that learners, especially those without any relevant background, can develop a theoretical foundation about the topics covered in the course. For those who are K-12 educators, getting exposed to current literature may help them reflect their own teaching practices and bring the reflection into the course experience as well. In the end, an evidence-based approach is strongly recommend for the design of MOOCs. By collecting multiple aspects of voices, MOOC instructors and designers can tailor the course to the most critical need of the teachers. Also, learners' responses to post-course survey can also help improve the design for future offerings of the course.

On the other hand, it is noteworthy that the LITTLE framework is still in its preliminary phase and has not been validated by any empirical studies. In addition, the interpretation of the LITTLE framework may be relied on the reflection on several MOOCs that the authors have been involved in the design and the facilitation of the course. To further improve the rigor and the validity of this model, a wider range of replications in other MOOCs is needed.

Acknowledgements
The authors would like to express the gratitude to the course instructors and teaching assistants for the Canvas MOOC, *Technology Applications in Education*. The authors also appreciate the constructive comments from the editor and the reviewers which have been extremely helpful to this article.

Funding
The authors received no direct funding for this research.

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Disclosure statement
No potential conflict of interest was reported by the author(s).

Citation information
Cite this article as: Designing MOOCs with LITTLE, Hengtao Tang & Yingxiao Qian, *Cogent Education* (2022), 9: 2064411.

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Cogent Education **(ISSN: 2331-186X) is published by Cogent OA, part of Taylor & Francis Group.**