Promoting and Evaluating Professional Learning Among Teachers Through Open Online Discussions

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Abstract
Discussion is a neglected design element of open online courses but has the potential to promote and evaluate professional learning and knowledge building among working professionals. Professional learning requires application to achieve its aim. Open online courses can reach professionals at scale, but to demonstrate effectiveness, it is important to show that learning can be applied to practice. Existing metrics (e.g. enrollments, tests, quizzes and completions rates) are limited in their capacity to evidence this. However, by designing discussion prompts to elicit professional learning, it is possible to scaffold the application and exchange of knowledge among peers, and thus more effectively track the effectiveness of the course in supporting professionals' learning through social interactions. This paper analyses discussions in an open online course for teachers working in crisis and emergency settings and other challenging environments. By critically synthesizing existing theories, we developed an *Online Discussion Value Framework,* modified it by incorporating preliminary codes derived from qualitative analysis of discussion data (discussion prompts and participating teachers' posts), and, finally, applied it to the full dataset. The findings showed the efficacy of the framework in analyzing the extent to which online discussions were effective to support teachers' quality professional learning. We conclude by elucidating the implications of this study for advancing research into effective online discussions, and for guiding and evaluating discussions as a powerful pedagogical tool to support professional learning in large-scale, open, online courses. Limitations and future research directions are suggested.

Keywords: Online open courses, online discussions, professional learning, teacher professional development scaffolding, social interaction

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Open online courses (e.g. in Massive Open Online Courses or MOOCs) hold great potential for providing affordable teacher professional development (TPD) in contexts where conventional methods are unable to address the scale of the demand. Such circumstances include mass displacement resulting from conflicts and crises that routinely produce teacher shortages. Shortages occur for multiple reasons. For example, teachers within displaced communities may have left or become traumatized and are no longer able to teach (Burns & Lawrie, 2015). School systems within the host community become overwhelmed with the numbers and complex needs of refugee children. In these contexts, TPD provided at scale can make an enormous difference by enabling teachers to become key agents of change for displaced communities and supporting children and young people to prosper both inside and outside the classroom (Pherali, et al., 2020). For these reasons, open online courses are advocated by governments and international organisations such as UNESCO as a viable means for upskilling the teaching profession on a large scale to address equity issues in education (Laurillard & Kennedy, 2017). Professional learning in open online courses is therefore important for equipping teachers with updated professional knowledge to support their students' learning needs, especially those students who come from disadvantaged social backgrounds and regions lacking quality educational resources. Open online courses have also been reported to support professional learning in other fields, such as nursing, health care, social policy (Anderson et al., 2020; Longhini et al., 2021), environmental education (DuBois et al., 2019), engineering, and management (Kop et al., 2011). Studies found that enrolled participants of open online courses were mostly working professionals, in particular educators (Glass et al., 2016; Liu et al., 2020). Professionals like these need applied knowledge gained through collaborative learning (e.g., exchanging experiences and expertise, propose solutions to ill-structured problems) to gain new knowledge and take action in complex workplace situations (Kellogg et al., 2014).

Open online courses offer a range of learning activities, such as viewing educational videos and readings, contributing to online discussions, taking online quizzes, and assessing peer assignments. Such activities assist participants to engage in a technology-supported learning environment and jointly build a community of practice where they socially construct knowledge regardless of their differing geographic locations and cultural backgrounds (Phan, 2018; Rivera et al., 2024; Sullivan et al., 2018). Data traces of participants' engagement with these activities are automatically collected by course platforms and their analysis typically informs course evaluations (Cohen et al., 2019; Kent et al., 2016). Yet none of these activities can effectively track application of learning to practice, which is the objective of such initiatives. This could be achieved, however, through the analysis of contributions to online discussions. To demonstrate the effectiveness of large-scale, open, online courses, therefore, we propose the analysis of discussions to elicit and evaluate professional learning.

Most platforms make online discussions available to participants (Phan, 2018; Quintana et al., 2021). When appropriately designed, online discussions can engage participants in peer learning and collaboration (Galikyan et al., 2021; Kellogg et al., 2014; Koehler et al., 2020), which potentially support participants' achievement of higher-order learning outcomes. Such outcomes range from conceptual understanding and practical applications to the skills of communication, problem-solving, critical thinking, and reflection (Garrison, 2006; Pečar, 2016). Existing research shows that professionals taking open online courses benefit from discussions in several ways. Professionals engaged in online discussions form social networks with peers to

negotiate and co-create professional knowledge which is especially important for those working in isolated locations (DuBois et al., 2019; Quintana et al., 2021), are motivated to apply new learning in their workplace (Anderson et al., 2020), and when appropriately facilitated, can self-reflect and transform pre-existing assumptions (Lee & Brett, 2015).

Nonetheless, the potential of discussions in open online courses to support professional learning outcomes is not always realised. Existing studies found several problems associated with online discussions. Participants' contributions to online discussions were often superficial (Han & Ellis, 2019; Koehler et al., 2020), viewed exclusively as help seeking or giving (Wise & Cui, 2018; Wong et al., 2015), confined largely to social interactions with limited peer collaboration (Cohen et al., 2019; Murphy, 2004), lacked coherence in discussion threads (Kent et al., 2016), and were often performed to merely satisfy course requirements without clarifying personally meaningful goals (Koehler et al., 2020). Furthermore, discussion forums in open online courses are often unstructured, chaotic, and full of irrelevant posts (Wise et al., 2017). Although such problems were reported for participants of open online courses generally, they were especially noticeable for professionals, since professionals typically needed to juggle demands of work, life, and online learning (Liu et al., 2020). To overcome such drawbacks, researchers propose aligning online discussions with expected learning outcomes and providing pedagogical scaffolds such as discussion prompts and moderation to engage participants socially and cognitively (Aloni & Harrington, 2018; Chiu & Hew, 2018; Phan, 2018; Yücel & Usluel, 2016). This paper argues for a similar approach in open online learning for professionals such as schoolteachers working in isolated, challenging contexts in the current study.

The scaffolding of effective online discussions within open online TPD courses for teachers in contexts of mass displacement is a critical step to improving the benefits that such courses can provide. First, it can improve the learning experience for teachers by creating a sense of community for isolated teachers, and enable them to learn from their peers, providing the kind of practical knowledge necessary for challenging environments (Kennedy & Laurillard, 2024). Second, and critically, it can provide evidence of participants' learning, demonstrating the return on investment for funders and providing a potential pathway to professional certification for teachers. With this aim in mind, this paper analyses contributions to online discussions within two iterations of an open online TPD course "Transforming Education in Challenging Environments" (TECE) for teachers working in crises and emergency settings. The course engages participants in discussions and other collaborative activities around video case studies of teachers who are teaching refugees in low-resourced environments. The discussions aim to guide participants to share and build upon the effective practices of peers in a global community of practice and apply the concepts and ideas to their own practice.

Professional Learning in Open Online Discussion

Most existing studies of open online discussion used some form of automated analysis such as keyword search and learning analytics (Wong et al., 2015). Several studies investigated the relationship between the social (e.g., participants' number of posts; social centrality in peer interactions) and cognitive (e.g., quality of participants' posts) aspects of online discussions. Earlier studies reported the relationship between participation in discussions (e.g., number of posts) and course performance (e.g., assessment scores, course completion) (c.f., Palmer et al., 2008). In recent studies employing quantitative methods such as learning analytics and content

analysis, participation in discussions has been associated with course completion, intensity of cognitive activities (e.g., assignment preparation) (Cohen et al., 2019), and learning outcomes (test scores and quality of posts) (Kent et al., 2016). Wise & Cui (2018) found that a small group of strongly socially connected participants were able to discuss substantive content and express learning-related emotions. Galikyan et al., 2021) reported that the social aspect (number of participants' contributions to discussion threads) moderated the relationship between the lowest cognitive engagement (sharing ideas without elaboration or evaluation) and course performance.

As such, existing research largely supports the link between the social and cognitive aspects of discussions but does not discuss specifically whether and how pedagogical scaffolding in discussions facilitate professional learning through social interactions. Neither does the research consider whether participant contributions to discussions could provide evidence that professional learning has taken place. Thus, the primary purpose of this study is to examine these issues qualitatively in the context of the TECE course. Finally, in open online courses, the impact of professional development occurs as professionals put into practice what they have learnt to make changes in the world (Chen et al., 2009; Lee & Brett, 2015; Sullivan et al., 2018). For example, educators need to use their learning to improve the teaching and learning experiences for the children and young people they teach (DuBois et al., 2019). Without this applied learning, the aims of professional development cannot be fully realised. Therefore, this paper considers how social learning in online discussions can contribute to supporting application to practice and evidencing when it has occurred among working professionals. The paper achieves this purpose by exploring the key research question:

> To what extent are online discussions effective in supporting participating teachers' professional learning by taking the TECE course?

Studies focusing on the pedagogical design of discussions among professionals in open online courses were often informed by theories stressing the social construction of knowledge. For example, Anderson et al.'s (2020) study of an open online course for healthcare professionals found that those who engaged more actively in social interactions through social media attained higher knowledge outcomes compared with others who had fewer social interactions. These authors framed their study using three theoretical sources. The first was Bandura's social learning theory (Bandura, 1991, 2001), which views learning as a result of learners observing others' behaviour and seeing its consequences; thus learning could not be separated from its social context—this is why many authors referred to "social learning" when discussing the social construction of knowledge during online discussions and other collaborative learning activities (Anderson et al., 2020; Rivera et al., 2024). The second was Lave and Wenger's (1991) situated learning theory, which considers learning to be learners' social construction of knowledge as they collectively solve problems to attain shared goals within their community of practice (e.g., an open online course). The third was connectivism, which suggests that technology-facilitated interactions such as online discussions support cyclical learning by enabling learners to exchange information, share knowledge, and change beliefs, behaviour, and cognition (Goldie, 2016). Connectivism was adopted by Bonafini (2018) as the theoretical lens in a study of online discussions of a TPD open online course, in which the author analysed how super-posters actively built networks that explored and shared information and resources with others. While the aforementioned authors emphasised facilitating

professionals' online discussions as a social process whereby they created, shared, and applied work-related knowledge, Lee and Brett (2015) went further by drawing on Mezirow's (2003) transformative learning theory and Bakhtin's (1981) concept of dialogue to purposefully design and analyse discussions in an online course. Through social interactions during online discussions, teachers represented the self to others, encountered different perspectives which triggered their cognitive dissonance, and engaged in critical self-reflection which helped them transform their pre-existing values and beliefs (Lee & Brett, 2015).

We draw two key points drawn from the above analysis of existing research. First, professional learning in online discussions is essentially a social process that can potentially enhance professional's understanding of course content (e.g., concepts, work-related values, and beliefs) and application of learning to practice by encouraging their sharing of work-related experience and collaborative problem-solving. Second, professional learning in online discussions needs to be supported by instructors' pedagogical scaffolding (i.e., design of discussion prompts and facilitation of interactions), which can enable professionals' social learning within their community of practice. Based on these two points, we propose two sub-research questions for this study:

1. To what extent are instructors' discussion prompts effective in supporting participating teachers' professional learning (understanding of course content and application of learning to practice) in the TECE course?

2. To what extent do teachers' posts exhibit quality professional learning in the course?

Online Discussion Value Framework

To our knowledge, no existing frameworks are available for analysing all elements of online discussions including applied aspects of professional learning. Thus, we have reviewed and critically synthesized three empirically tested theoretical models. These models are relevant to this study, since each of them have been proposed to qualitatively analyse the quality of socially constructed knowledge or understanding and could provide theoretical insights for proposing an analytical framework for this study (see Table 2), which we call Online Discussion Value Framework. The framework allows us to analyse the discussion data of the TECE course to analyse the effectiveness of online discussions in supporting teachers' professional learning. In the framework, we have integrated three theoretical models: (1) Wenger et al.'s (2011) *value creation framework*, (2) Kember et al.'s (2008) *reflective thinking model,* and (3) Murphy's (2004) *peer collaboration model*. We first propose categories for analysing participants' posts. Based on these categories that analyse professional learning, we suggest categories for examining discussion prompts intended to guide professional learning through discussions.

Wenger et al.'s (2011) value creation framework analyses the activities of members of a community of practice in which they share, create, and apply collective knowledge through solving practice-related problems to attain common goals and accumulate collective assets or value for the improvement of practice. Attention to social learning among members of communities of practice makes the model a core conceptual basis for our analytical framework. As this study focuses on professionals' social learning through online discussions, we have taken Wenger et al.'s (2011) concept of value creation which refers to participants' co-construction of

knowledge to transform practice in a community. To create value, participants must engage in iterative cycles of processes whereby they join in activities and exchanges, including:

> (1) sharing experiences (immediate value);
> (2) creating knowledge capital, such as skills, relationships, and resources (potential value);
> (3) applying knowledge capital to practice (applied value);
> (4) improving performance resulting from adapting approaches to effect changes in practice (realised value);
> (5) reconsidering strategies, goals, and success criteria to transform practice, which necessitates critical reflection (reframing value).

In communities of practice such as open online TPD courses, participants can potentially create professional value by engaging in iterative value creation cycles through interacting with peer professionals. Wenger et al.'s (2011) framework informed Booth & Kellogg's (2015) case study of school teachers' stories of knowledge sharing and co-creation through the five iterative cycles when participating in informal online teacher communities. We have adapted the category "sharing experiences" to indicate a lower level of participant understanding, while the adapted categories of "application of theory or personal insights" and "reframing" are used to indicate higher levels of participant understanding. Then we have integrated Kember et al.'s (2008) category critical reflection (see its explanation in next paragraph) with Wenger et al.'s (2011) category of reframing value to indicate participants' re-examination of personal perspectives and professional practices by engaging in critical reflection. Integrating value creation into the analytical framework allows us, therefore, to account for professional learning within the discussion.

Kember et al.'s (2008) reflective thinking model distinguishes different qualities of reflective thinking demonstrated by learners' online discussions or written work. The model comprises four categories: (1) habitual action (following a procedure or routine without thinking about the underlying concept); (2) understanding (attempts to find the underlying meaning of a concept or theory without realising its relevance to personal experience or real-life problems); (3) reflection (considering a concept in relation to personal experience or its application in practice, often showing personal insights); (4) critical reflection (re-examining deep-rooted beliefs to transform existing perspectives or practice). The model informed a number of empirical studies that analysed learners' online discussions (Radović et al., 2023) or written work (e.g., Liu et al., 2022). For example, the model informed Radović et al.'s (2023) analysis of open university students' online discussions, which concluded that the discussions contributed to students' deeper understanding and higher levels of reflection, and was associated with learning motivation and satisfaction. From Kember et al.'s (2008) model, we have borrowed reflection as an intermediate category describing participants' reflection on personal experiences, real-life situations, or professional practices without challenging personal (or others') perspectives.

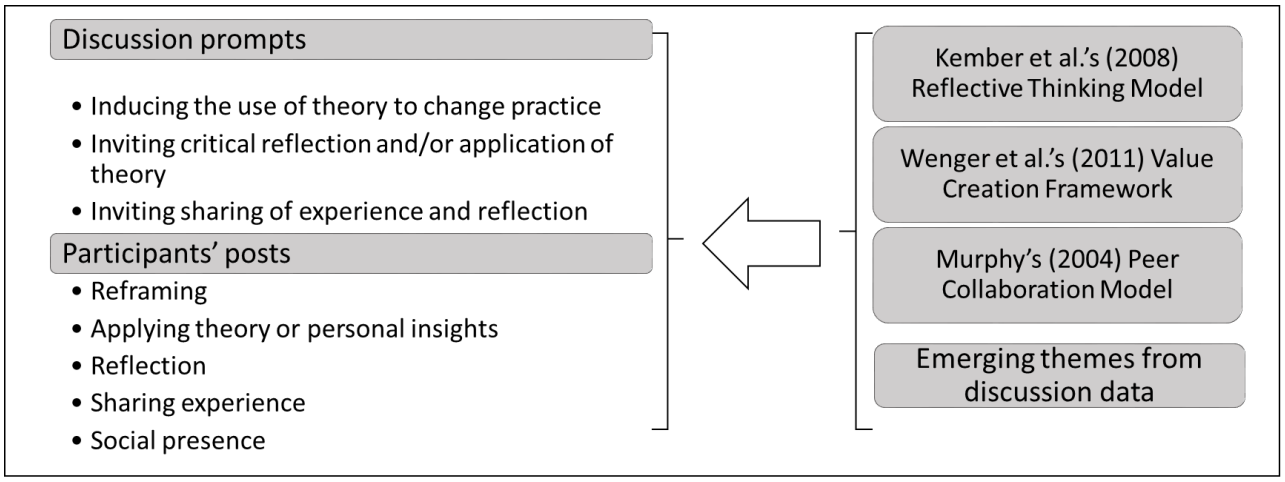
Murphy's (2004) peer collaboration model pertains to collaborative peer learning processes in online discussions, which proceed from simple to complex peer interactions. These include: (1) social presence (e.g., exchanging personal information, showing appreciation); (2) sharing personal perspectives; (3) accommodating and reflecting on peers' perspectives; (4)

constructing shared perspectives; (5) negotiating shared goals; (6) producing shared artifacts. Schaefer et al. (2019) adapted the model to analyse the role of social presence and instructor facilitation during online discussions in an online course, and reported both factors being important for participants' collaborative learning. We have adapted the category of "social presence" (the basic level) to describe participants' posts (or elicitation of such posts by discussion prompts) that only serve a social purpose.

The preceding paragraphs have identified and explained how the Online Discussion Value Framework evolved from its theoretical sources, which helps clarify the conceptual background of the framework based on literature review. It is also important to note that the framework is informed by preliminary codes derived from a qualitative analysis of the discussion data of TECE, so that it is grounded in data (see subsection Ensuring Validity in Methodology (Brooks et al., 2015) (see subsection Data analysis in Methodology for details). Identifying these sources help enhance the theoretical/historical validity of the framework (see subsection Validity in this study in Methodology for more details). Figure 1 summarises the sources informing the framework. The description of the categories in the framework is presented in Table 2 of the subsection on Data analysis in Methodology.

Figure 1

Sources That Have Informed the Online Discussion Value Framework



Methodology

Research Approach and Context

To understand the extent to which instructors' pedagogical scaffolding of online discussions (in particular, discussion prompts) supported participating teachers' professional learning in TECE, we employed a qualitative approach to collect and analyse the rich data from online discussions, including instructors' discussion prompts and participating teachers' posts. By exploring the qualitative data, we derived preliminary codes and compared such codes with the categories derived from the theoretical models previously noted. This formed the basis upon which we developed the Online Discussion Value Framework. Thereafter, we tested it against the dataset to refine it, as themes emerged to address the research questions.

TECE was co-designed by researchers from the RELIEF Centre (a collaboration among University College London, Centre for Lebanese Studies, and American University Beirut) with teachers and teacher-educators from public and private universities, NGOs, and government bodies in Lebanon. The course conceived of teachers working in conditions of mass displacement and other challenging contexts as "transformative intellectuals." Relevant theoretical concepts are introduced to promote teaching that is caring, creative with limited resources, committed to a holistic understanding of the child in context, and capable of challenging dominant thinking. The instructional videos were shot on location in Lebanon, a country with the highest per capita number of refugees in the world, foregrounding the work of teachers (many of whom were themselves refugees).

Data Collection and Participants

The discussion data were drawn from the first two runs of TECE. From both runs of the course, one step (i.e., unit) per week of the four-week course was selected (see Table 1). In run 1, 1203 participants enrolled, 721 took part and 187 participated in discussions. In run 2, 1637 enrolled, 1107 took part and 318 participated in discussions. Permission was gained from participants and course instructors for quoting the discussion prompts and posts. Their names are replaced with gender-neutral pseudonyms to maintain confidentiality. From the selected units, a total of eight discussion prompts and 559 posts were collected for qualitative analysis. The sample of participants comprised those who enrolled in the two runs of the course and participated in online discussions.

Table 1

Selected Steps in TECE

Week	Selected steps
Week 1	Step 1.2: A challenge for educators
Week 2	Step 2.4: Applying the Ecological Systems Theory
Week 3	Step 3.11 in Run 1 (renumbered as 3.10 in Run 2): Limits to what we can do as educators
Week 4	Step 4.10: How can digital tools help?

Data Analysis

Our evaluation of online discussions can be described as a bottom-up template analysis (Brooks et al., 2015). We adopted a contextualist epistemological position that acknowledges there may be multiple interpretations of the qualitative data, but that the results of the analysis are justified on the basis that they are grounded in the data gathered in a naturalistic research setting (Madill et al., 2000).

The two researchers collaboratively used NVivo 12 to code the data, sharing the amalgamated codes and sub-codes, as well as data files to enable each researcher to use and amend the same template. We adopted four stages of data analysis to enhance the face and content validity of the analytical framework and trustworthiness of qualitative findings (see subsection Ensuring Validity in this study).

In Stage 1, preliminary, open codes were developed by immersion in the data. This involved review of online discussions by two independent researchers who made notes about key ideas of the text, summarised the notes into preliminary codes, then collaborated to resolve disagreement through regular research meetings. We first generated the preliminary codes by analysing the online discussions in Run 1. Then we applied the codes to the discussions in Run 2, making refinements to ensure that the preliminary codes captured the key ideas of the discussion data.

In Stage 2, the researchers compared preliminary codes with the categories derived from the three existing theoretical models (see Figure 1 in the section Online Discussion Value Framework). In this process, further themes and subthemes emerged from the remaining data and were incorporated into the framework. For example, a new subtheme, "sharing artefacts" (sharing collective knowledge products as a novel approach to practice), was added to the theme "reframing," which expanded the original meaning (engaging in critical reflection to reframe beliefs or practice) of the theme.

In Stage 3, the Online Discussion Value Framework was developed as a template to aid the coding of data in order to analyse the extent to which the discussions were effective in supporting professional learning in terms of the quality of professional learning that discussion prompts were intended to elicit from participants and the quality of professional learning as demonstrated by participants' posts. We then revisited the framework in the light of our preliminary codes which were incorporated to create the final template (Table 2) for analysis. This process continued as the template was used to analyse the full dataset.

Finally, in Stage 4, the resulting template was re-applied to a subsection of the data (discussions in Run 2) to ensure that it remained a good fit.

Table 2

Online Discussion Value Framework

Themes	Description
Template for analysing discussion prompts	
Encouraging the use of theory to change practice	Prompting theory informed practice – the adaptation of theory to one's own context to transform existing practice
Inviting critical reflection and application of theory	Inviting critical reflection and / or application of theory, but not necessarily changing existing practice
Inviting sharing of experience and reflection	Inviting experience sharing and reflection, without necessarily engaging in critical analysis of problems in one's context
Template for analysing discussion posts	
Reframing	Posts showing engagement in critical reflection or sharing of collective knowledge products to transform (i.e., rethink and reshape) one's beliefs or transform practice
Applying theory or personal insights	Posts demonstrating realised value or applied value where personal insights/ideas are used to improve practice
Reflection	Posts showing reflection on experiences, situations, and/or practices
Sharing experience	Posts that share experiences, situations, and/or practices without reflection
Social presence	Posts that primarily serve social purposes; sometimes expressing a vague / irrelevant idea

Ensuring Validity in this Study

Validity and credibility of this qualitative study were guaranteed using several strategies. First, we used an iterative process of data analysis, including regular meetings between the researchers to check consistency in analysis and testing of the rationale for addition of new themes or subthemes. Such a process ensured the theoretical validity (the extent to which the relationships between the codes/subcodes are applicable to similar contexts) and face/content validity (the extent to which the categories or codes/subcodes accurately reflected a full range of meaning made by research participants) of the analytical framework (Gaber & Gaber, 2010), and as the trustworthiness of qualitative findings (the extent to which findings were grounded in the data) (Madill et al., 2000).

Second, validity was increased by using peer review (Creswell & Miller, 2000). The researchers invited an external reviewer who was familiar with TECE to offer critical comments. This resulted in refinements to the analytical framework and interpretation of emerging themes. One example was adding social presence from Murphy (2004) for analysing participants' posts and modifying the interpretation of discussion posts in this category (instead of merely serving social purposes, such posts helped to create a warm social environment for teachers' professional learning).

Third, to enhance the applicability of the analytical framework and findings to similar contexts (e.g., other open online courses for professional development), we have presented a

thick description of the research context and process, as well as illustration of the themes with rich quotes. These strategies help readers determine whether the research outcomes of this study are transferable to their own contexts (Miles & Huberman, 1994).

Fourth, validity was ensured by additional means, including research notes on major decisions (e.g., selection of online discussions) and prolonged engagement in the research context (e.g., ongoing observations of online discussions of TECE) to ensure that the findings of this study are dependable (Creswell & Miller, 2000).

Findings and Discussion

Findings from analysis of the eight online discussions in TECE are considered below. The analysis identifies and interprets the effectiveness of the framing of discussion prompts in supporting the quality of learning as expressed by teachers' discussion posts in response to the prompts. We present the themes related to these elements of online discussions by providing illustrative quotes, discussing the themes in relation to research literature and elaborating on their implications for practitioners of open online and blended learning courses.

Discussion Prompts

In TECE, discussion prompts were offered at the end of each unit in the course, following each item of video or text, and accompanying exercises. They were deliberately designed to create meaningful discussion, rather than encourage superficial posts found in previous research (c.f., Han & Ellis, 2019; Wise & Cui, 2018).

As displayed in Table 3, the discussion prompts were coded into three categories, including: (a) encouraging the use of theory to change practice, (b) inviting critical reflection, and (c) inviting experience sharing and reflection. Table 3 shows these themes and the text of the prompts. The levels of participants' understanding intended by these three categories of prompts formed a hierarchical structure, like Kember et al.'s (2008) and Murphy's (2004) models for analysing online discussions or written assignments, as well as Wenger et al.'s (2011) model for examining collective knowledge construction in communities of practice. Our analysis found that there was a connection between the complexity of the responses and the design of the prompts (see subsection "Participants' Posts"). This echoes other authors' (Koehler et al., 2020; Pečar, 2016; Phan, 2018) suggestion that discussion posts should be purposefully designed to provide pedagogical scaffolding for professional learning in discussions of open online courses.

Four prompts were coded as "theory informed practice," which elicited participants' understanding at the highest level of complexity by asking participants to demonstrate critical reflection or apply theory with a view to changing their existing beliefs or practice. One prompt was categorised as "inviting critical reflection," eliciting participants' understanding at an intermediate level of complexity by inviting their examination or evaluation of an experience or a situation but not necessarily aiming to change practice. Together, these prompts aimed to promote participants' learning at the levels of "reframing" and "applying theory or personal insights" (see subsection Participants' Posts). These prompts aimed to stimulate participants' complex understanding (Kember et al., 2008) or higher levels cognitive engagement (Galikyan et al., 2021).

Three discussion prompts were coded as inviting experience, sharing, and reflection. These prompts elicited participants' basic understanding at a lower cognitive level (Galikyan et al., 2021; Kember et al., 2008) "reflection" or "sharing experience". Despite such limitations, these prompts supported participants' sense of being members of a community of practice by encouraging their active involvement in discussions and enabling their professional learning through social interactions with peers (Schaefer et al., 2019).

Although the prompt for Step 4.10 in Run 2 was an adaptation of the prompt in Run 1, it unwittingly elicited a lower level of understanding. While the prompt of Step 4.10 in Run 1 asked participants to demonstrate complex understanding (encouraging the use of theory to change practice), in Run 2 the prompt for the same step asked participants to show basic understanding (inviting sharing of experience and reflection). This finding implies that instructors need to think carefully about (re)designing prompts at appropriate cognitive levels to optimise participants' learning and to critically evaluate discussion questions and facilitation before/during discussions, so that social learning is guided towards higher levels of understanding and knowledge application (Anderson et al., 2020; Lee & Brett, 2015).

Discussion Posts

Teachers' posts extracted from the eight online discussions were coded into five themes: reframing, applying theory or personal insights, reflection, sharing experience, and social presence, which we analyse in detail below.

Reframing

Reframing captures participants' engagement in critical reflection or sharing of collective knowledge products to transform beliefs or practice, where the sharing of ideas or products is accompanied by evaluation or examination. Since reframing represents the highest level of complexity in participants' understanding and places a high demand of participants' cognitive thinking (Galikyan et al., 2021; Kember et al., 2008), it is not surprising that just 48 (8.6%) of the 559 posts were coded into this theme.

The following quote illustrates a participant's critical reflection on how teachers' practice in a challenging situation could be transformed by applying Bronfenbrenner's (2000) ecological systems theory to elevate children from financial difficulties affecting their education. The post responded to the prompt of Step 2.4 in Run 2 asking for "one line each to describe the situation, what they did, which of the ecological systems they worked in, and what they could have done further."

> Two children from a family were unable to attend school due to the cost of book and uniform fees. I discussed the issue with the guidance teacher and addressed the issue with the social worker to fill paperwork for providing funds for the children. I was working within the mesosystem while addressing the issue with the guidance teacher and within the exosystem when addressing it with the social worker. We could have gone to the School Head as it happens with many students; we could have worked with the village chief to create a committee to raise the funds... These changes are in the exosystem. (Indigo, participant, Step 2.4, Run 2)

In this post, the application of terms “mesosystem” and “exosystem” to the teachers’ practice demonstrated Indigo’s understanding of the way such practice could influence not just students’ school experience, but also the other social systems in which the students inhabited. Indigo went further to show how, on reflection, teachers could have reframed practice by working with the students’ community.

Some participants shared knowledge products with a view to changing practice, as illustrated by Teri’s post that responded to the prompt of Step 4.10 in Run 1 (see Table 3) asking participants to critique and redesign an existing learning design. Terri shared the redesign and explained how the adjustments suited learners’ preferences.

> There is a real-life aspect to the design that is lacking…. Where I am in Africa, it is a down-to-earth society from the get-go and (people) would like to experience things before diving into technical aspects and theory…. A section for [digital artefacts] have been added as a means to share learners’ real-life input, in addition to that of the instructor. [link to learning design] (Teri, participant, Step 4.10, Run 1)

It could be seen that the posts in the category of “reframing” demonstrated participants’ critical reflection or sharing of knowledge outputs with an intention to reshape beliefs (Kember et al., 2008) or transform practice (Wenger et al., 2011). Such posts indicated participants’ reframing value in Wenger et al.’s (2011) value creation model. The scarcity of posts coded into this theme suggests that most professionals need instructors’ facilitation during discussions to attain a high level of critical reflection which helps transform their perspectives through meaningful peer interactions (Lee & Brett, 2015).

Applying Theory or Personal Insights

The theme “applying theory or personal insights” demonstrated participants’ application of a newly learned theory or a new personal insight to improve practice, which necessitated critical reflection or in-depth evaluation. Thus, this theme indicates an intermediate level of complexity in participants’ understanding. Of the 559 posts, 144 (25.8%) were classified in this category.

The post below shows a participant’s application of theory in response to the prompt of Step 3.10 in Run 1 asking participants to discuss barriers to applying transformative teaching approaches and suggest solutions:

> If you have parents who are unwilling to take an interest in the child's education or principals who see their role as just mainly running the school…. then these create a barrier to the process of Transformative Education. To overcome these barriers, you could build relationships with other teachers and share ideas and concerns with them. Then usually those teachers will collaboratively join to help. Once the principal and parents see positive changes in the child, they will eventually want to help too…. (Blue, participant, Step 3.10, Run 1)

In the post, Blue applied a transformative approach (building positive relationships) learned in the course by analysing a situation where the stakeholders were uninterested in children’s education and suggesting ways to build positive relationships with them. Blue could

go further by addressing the roots underlying the stakeholders' reluctance to improve children's education to thoroughly resolve the barrier.

In another post, Ryan applied ecological systems theory by interpreting a challenging situation in terms of the teacher thinking beyond their micro context to the wider macro context that the children also inhabit, which showed her understanding of the rationale for applying the theory in real-life situations.

> I believe teachers need to be prepared to discuss these macro issues (discrimination, harassment and segregation of refugees) to help children understand the environment better and cope in a healthy way. (Ryan, participant, Step 2.4, Run 2)

While the above posts demonstrate participants' application of theories to learning situations, the following post by Daryl shows the use of personal insights to critically analyse digital methods, which responded to the prompt of Step 4.10 of Run 2 asking about their ideas about the digital methods they experienced (see Table 3).

> Technology can be a double-edged sword. We can all relate to a server breaking down, rendering the Interactive White Board unusable as well as notepads, laptops and other resources. On the flip side, technology has changed teaching considerably, helping to engage children fully in lessons. Children are more enthusiastic at working digitally. (Daryl, participant, Step 4.10, Run 2)

As analysed above, posts in this category demonstrated participants' creation of applied value (applying knowledge to improve practice) (Wenger et al., 2011). Nevertheless, these posts did not show an intention to transform practice, which usually required reshaping beliefs and activities of their local context (Kember et al., 2008; Wenger et al., 2011). Thus, these posts showed less complex understanding (or a lower cognitive level) compared with those in the reframing category. Despite this limitation, such posts showed participants' capability to transfer new learning to practice, which was a valuable learning outcome from their collaborative social learning (Schaefer et al., 2019). Since critical reflection is a complex form of understanding, the finding that a quarter of posts are coded under this theme implies that the online discussions were effective in supporting quality professional learning.

Reflection

Reflection denotes participants' perception of an experience, practice, and/or situations which were lacking in attempts to examine or evaluate such experience or practice or integrate theory into practice. 259 (46.3%) of the 559 posts were classified into this category, which was nearly half of all posts in the eight discussions.

The post below responded to the prompt in Step 1.2 of Run 1 asking participants to share good teaching and learning environments they experienced and explain why they felt so (see Table 3).

> When I was a student, I enjoyed a lot and learned a lot from informal activities like playing or when I was tasked to do the activities. Now I am a teacher, my students learn a lot when they do more activities. (Eden, participant, Step 1.2, Run 1)

In this post, Eden shared positive learning and teaching experiences, but did not analyse what made such experiences positive, which did not fully address the prompt.

In a post responding to the prompt of Step 4.10 in Run 2 inviting participants to share thoughts about digital methods learned in the course (see Table 3), Harper shared concerns and potential benefits of digital methods, but did not engage in examination or evaluation of such methods.

> I feel a bit intimidated by technology. I am worried that it will go wrong and the lesson will fall apart. However, I can see some benefits of using it and the students would definitely find the lessons more engaging. I have found this online course very useful and enjoy the combination of video, written work and interactive elements. (Harper, participant, Step 4.1, Run 2)

To summarise, posts coded as reflection demonstrated participants' basic understanding, which was at a lower cognitive level compared with reframing and applying theory or personal insights. These posts indicated participants' potential value created through online discussions, that is, the creation of potential personal and collective knowledge capital (Wenger et al., 2011), which had yet to be applied or realised by engaging in critical examination of experiences, situations or by applying theory to practice. Thus, how professionals can be supported to move beyond reflection in online discussions deserves instructors' careful consideration when designing discussion prompts, so that professionals are guided to go beyond superficially sharing ideas without further evaluating such ideas to improve understanding (Booth & Kellogg, 2015; Pečar, 2016).

Sharing Experience

Sharing experience captures the meaning of posts in which participants shared experiences, situations, or practices without engaging in reflection, which is another category representing participants' basic understanding. Nearly a quarter of the 559 posts being analysed (102 posts; 18.2% of all posts) fell into this category.

In the following post responding to the prompt of Step 1.2 of Run 1 asking participants to share and explain good learning environments they experienced (see Table 3), Jean described the elements of positive environments without explaining "What made it good for you?" as instructed.

> At primary school, the teacher used to decorate the classroom with our best work. Everyone tried to produce the best work so that it is displayed in the classroom before the end of the school year. The teacher assisted some students, so that everyone had a chance to have at least one work displayed. It was great. (Jean, participant, Step 1.2, Run 1)

Similarly, in the post below (responding to the prompt of Step 4.10 of Run 2) asking participants to share ideas of digital methods learned in the course (see Table 3). Gabriel described a difficult situation where technological resources were lacking in the learning environment, but did not go further to explain the causes for, or the solutions to, the difficulties.

> In our country, Lebanon, internet is not that fast. We sometimes face difficulties in using online learning. Some students don't have the necessary tools at home which makes it even more difficult. (Gabriel, participant, Step 4.10, Run 2)

As the above analysis suggests, posts coded as sharing experience facilitated participants' exchange of experiences, situations, or practices, which were indicative of participants' immediate value (sharing of stories or experiences) (Wenger et al., 2011) created through discussions. Such posts did not illuminate ways to improve practice. Thus, the posts in the category sharing experience were at a lower level of cognitive complexity compared with posts in the category reflection. One common feature of many posts in discussion forums of open online courses is participants' superficial sharing of experience without reflection (Schaefer et al., 2019; Wise & Cui, 2018). Though such posts are important in establishing a collaborative learning atmosphere, undoubtedly instructors need to move professionals' social learning beyond such basic understanding to attain higher learning outcomes.

Social Presence

Social presence represents the posts that either served social purposes without concretely answering the questions asked in discussion prompts or expressed ideas that were irrelevant to the prompts. Just 8 (1.4%) of the 559 posts were coded into this category.

In the following posts, Mackenzie and Nico showed an intention to interact with others but did not respond to the prompts (prompt in Step 1.2 of Run 2 - to share and explain personal learning and teaching experiences; prompt in Step 4.10, Run 2 - to express ideas about digital methods learned in the course).

> I am happy to join with you on education in a challenging environment. I hope to get many experiences from you. (Mackenzie, participant, Step 1.2, Run 2)

> This week will allow further digital implementation—looking forward to it. (Nico, participant, Step 4.10, Run 2)

The post below responded to the prompt for Step 2.4 of Run 2 that invited participants to analyse a difficult situation and suggest actions to improve it by applying a theory (ecological systems theory). In the post, Skylar saw the helpfulness of the theory but did not examine how the theory could help in improving practice.

> I feel the concept of the ecological system theory is very interesting and applicable especially in emergency context. This will enhance teaching and learning especially for children and young adults in our community of services. (Skylar, participant, Step 2.4, Run 2)

Based on the above analysis, although the posts coded as social presence showed participants' willingness to communicate socially with others (Murphy, 2004), such posts demonstrated basic understanding (or what Wenger et al. (2011) called "immediate value"). Without expressing ideas related to the substantive content, such posts had limited utility in participants' collaborative knowledge building (Aloni & Harrington, 2018; Wise & Cui, 2018). This is particularly relevant to professionals taking open online courses, who learn better when

they are facilitated to share work-related experiences and solve workplace problems, and to negotiate and create new knowledge, and to apply new knowledge to practice (Radović et al., 2023; Schaefer et al., 2019).

Summary

Most posts in the eight discussions were classified as reframing, applying theory or personal insights, and reflection, representing complex understanding (Kember et al., 2008) or higher levels of cognitive thinking (Galikyan et al., 2021). Such posts implied participants' creation of reframing value, applied value, and potential value through online discussions, which are the more advanced cycles in Wenger et al.'s (2011) value creation Model. A minority of the posts were categorised as sharing experience and social presence, which showed basic understanding or lower levels of cognitive thinking, or served social purposes, suggesting participants' creation of immediate value (Wenger et al., 2011). Despite such limitations, the posts in these two categories were meaningful to the extent that participants sharing such posts were more likely to gain peers' and instructors' social support, which might encourage them to become more cognitively engaged in discussions subsequently (Garrison, 2006; Kellogg et al., 2014; Radović et al., 2023).

The quality of professional learning that the posts demonstrated was largely in line with the kind of understanding that the discussion prompts had been designed to elicit from participant (see Table 3). For example, the discussion prompts of Step 1.2 of Run 1 and Run 2 (coded as "inviting sharing of experience and reflection") aimed to elicit participants' sharing and explanation of teaching-learning environments they experienced. Following instructions in these two steps, most participants put forward posts to show their application of theory/personal insights, or to share their reflection/experience. On the other hand, the prompts of Step 3.10 in Run 1 and Step 3.11 in Run 2 asked participants to apply theory to their local situation and suggest solutions for overcoming potential barriers, eliciting posts that were mostly coded as reframing, applying theory or personal insights, or reflection, which were at higher cognitive levels compared with those in Step 1.2 of the two Runs. These findings illustrated that when discussion prompts target at professional learning outcomes, professionals can be encouraged and supported to attain such outcomes, which echoes and provide evidence for other authors' (DuBois et al., 2019; Koehler et al., 2020; Phan, 2018) argument that online discussions can become a powerful tool to scaffold meaningful professional learning.

Conclusion

The failure of most open online courses to embed opportunities for social and collaborative learning is considered an "important obstacle that prevents them from reaching their potential" (Cohen et al., 2019, p. 193). Although researchers argued for the role of discussions to promote professionals' social learning in open online courses (c.f., Aloni & Harrington, 2018; Koehler et al., 2020), previous studies seldom examined the effectiveness of discussions (in particular, discussion prompts as a form of pedagogical scaffolding) in tandem with the quality of learning exhibited by professionals' contributions to discussions. This study was conducted to fill this gap.

We have proposed an Online Discussion Value Framework based on a critical synthesis of existing theories (Kember et al., 2008; Murphy, 2004; Wenger et al., 2011), which was refined

by applying it to the qualitative data from online discussions of the course under study. From the qualitative findings, we draw two conclusions. First, most discussion prompts were oriented to inducing participants' complex understanding and application of learning to practice. Second, most participating teachers' discussion posts demonstrated good qualities of professional learning and application of this learning to practice. Hence, we conclude that overall, online discussions in the course were effective in supporting teachers' professional learning. These findings provided evidence supporting other researchers' (e.g., Anderson et al., 2020; Phan, 2018; Rivera et al., 2024) assertion that online discussions, when appropriately designed, can promote professionals' quality learning through social interactions whereby they negotiate, create, share, and apply new work-related knowledge in their open online course as a community of practice. More importantly, the findings went beyond existing research by showing clear connections between instructors' discussion prompts and professionals' contributions both cognitively and socially

Implications

The research outcomes of this study have significant implications for enhancing and evidencing the effectiveness of online discussions in supporting quality professional learning in open online courses, small close online courses and blended-learning courses.

This study has proposed a new analytical framework to qualitatively analyse online discussions, departing from previous studies that mostly employed quantitative analysis (e.g., Chiu & Hew, 2018; Cohen et al., 2019; Kent et al., 2016). Key to this framework is the attention to professionals' social learning. Further studies may test, extend and/or revise it by analysing online discussions in different professional fields (e.g., social work, law, engineering, nursing, and management). Given the size and reach of open online courses, further research would benefit from using the framework as a basis for automating analysis of open online discussions.

This study provides practical implications. First, concurring with theoretical insights regarding learners' reflective thinking (Kember et al., 2008; Pečar, 2016), productive peer collaboration (Murphy, 2004; Schaefer et al., 2019), and collaborative knowledge creation to change professionals' perspectives and practice (Lee & Brett, 2015; Macià & García, 2016; Wenger et al., 2011), the findings showed that discussion prompts should be designed to orient professionals' understanding towards higher-order learning outcomes, such as applying theory to practice and critical reflection for transforming practice. Instructors can use the Online Discussion Value Framework as a guide to purposefully align online discussions to such professional learning outcomes. Second, templates for analysing participants' posts in our framework can inform meaningful evaluations of learning in open online courses either to evidence learning for stakeholders e.g. funders, or for participants themselves. In the latter case, the template could be used as a self-assessment tool to support participants to self-evaluate whether their shared ideas showed more complex (e.g., Applying theory) or basic (e.g., Sharing experience) understanding. Such a self-assessment tool could enable participants to identify their own learning and use their contributions to discussions to demonstrate that learning, such as by compiling an e-portfolio to showcase their learning to potential employers.

Limitations and Future Directions

This study has limitations. First, the discussion data were collected from an open online course providing learning support (e.g., instructors frequently provided facilitation to guide and

facilitate teachers' social interactions) that was probably greater than many other such courses could offer. This limits the transferability of the qualitative findings to other courses that are less well-resourced. Therefore, future studies can examine the relationship between the quality of discussion prompts and participants' contributions in other open online courses using the Online Discussion Value Framework. Second, study participants were mostly teachers. Researchers may study professionals in other fields (e.g., engineering, management, healthcare) to examine the efficacy of the framework to evaluate the effectiveness of online discussions in supporting professional learning. Third, researchers can apply the framework to the design of discussions in short, closed online courses to test its efficacy in analysing and evidencing social learning among participants.

Declarations

Statement of the Ethics Board Approval.

Permission to collect data from human subjects was approved by Ethics Board at Institute of Education, University College London (REC1607 Online Learning Design Research).

Declaration of interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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Appendix

Themes Related to Discussion Prompts

Themes	Discussion prompts
Encouraging the use of theory to change practice Four discussion prompts were coded into this theme.	**Step 3.10 in Run 1; Step 3.11 in Run 2: Limits to what we can do as educators** ***Note:*** Step 3.10 in Run 1 was renumbered as 3.11 in Run 2 without changing the wording. Can you think of tools, or methods, or channels that can be used to seek support? These could include local government referral systems, professional networks, etc. In the Padlet Support for teachers, suggest some channels, or methods, or mechanisms that could be offered to teachers, and suggest how they might provide support. Double-click on the wall, add your name if you wish, and type in your suggestions. What could be the barriers to a transformative approach to teaching in these challenging contexts? To what extent is it possible to overcome these barriers and promote transformative teaching and learning? Could the tools and methods you have been suggesting help in the process of becoming more transformative? And vice versa? Comment also on what other participants have said.
	Step 4.10 in Run 1: How can digital tools help? Here we look at a learning design that recognises that there are different cultures within a class. It was originally designed for upper primary school learners. Remembering some of the stories you have heard in the course, is the design sufficiently sensitive to work well for all the learners? Your task is to critique the design and adapt it in any way you think would better represent a transformative approach.
	Step 2.4 in Run 2: Applying the Ecological Systems Theory ***Note:*** The discussion prompt was re-formulated from Step 2.4 of Run 1. In the last two steps, we have spent some time getting to know the Ecological Systems Theory. In this step, we discuss the way it might apply to your own teaching and learning situations. Given your understanding of the Ecological Systems Theory and its different systems: Think of an example of a difficult situation you have faced with a child in your classroom. Identify what you did to try and improve the situation or support the child. Can you identify which of the systems you acted within in order to change or improve things? Who else (if anyone) did you work or connect with in order to address this difficult situation? Are there other actions that you could have taken within other systems around the child? If so, what are these?

Inviting critical reflection and / or application of theory One discussion prompt was coded into this theme.	**Step 2.4 in Run 1: Applying the Ecological Systems Theory** In the last two steps, we have spent some time getting to know the Ecological Systems Theory. In this step, we discuss the way it might apply to your own teaching and learning situations. Given your understanding of the Ecological Systems Theory and its different systems: Think of an example of a difficult situation you have faced with a child in your classroom. Identify what you did to try and improve the situation or support the child. Can you identify which of the systems you acted within in order to change or improve things? Who else (if anyone) did you work or connect with in order to address this difficult situation? Are there other actions that you could have taken within other systems around the child? If so, what are these? Add your ideas in the discussion in the following format: One line to describe the situation; What you did; Which of the ecological systems you were working in; Anything else you could have done in the other systems - name the system and what you might have done/or could do in future.
Inviting sharing of experience and reflection Three discussion prompts were coded into this theme.	**Step 1.2 in Run 1 and Step 1.2 in Run 2: A challenge for educators** As we are working as a community throughout the course, we encourage you to engage with the other participants. You can like and reply to comments made by others that you feel share some aspects of your own experience. (Added in Run 2) Now, think back to when you were a learner rather than a teacher. What was the best teaching and learning environment you experienced? What made it good for you? Share your experience…
	Step 4.10 in Run 2: How can digital tools help? In this step, 3 digital methods are already used - the *FutureLearn course* to participate, the *Mentimeter Word Cloud* to propose and share ideas, and *Discussion Forum* to discuss them. How do you feel about this and your other experiences of learning using digital methods? Make your comments by responding to at least 2 other comments, as well as creating your own. (Added in Run 2) You can see the learning design of Week 4 here and find out more in the downloads section below.