European Schoolnet Academy

Blended Learning in Teacher Education & Training

Findings from Research & Practice

Publisher: European Schoolnet (EUN Partnership AIBSL)
Rue de Trèves, 61
1040 Brussels, Belgium

Author: Eileen Kennedy, University College London

Editor: Benjamin Hertz, European Schoolnet

Please cite this publication as:
Kennedy, E. (2021) *Blended Learning in Teacher Education & Training: Findings from Research & Practice*, Brussels, Belgium

Published in February 2021

Illustrations by Irina Strelnikova / Adobe Stock

Contents

04 Executive Summary

06 Introduction

07 Review of Existing Research

- **a.** Methodology
- **b.** What is Blended Learning?
- **c.** Key Findings: The Benefits of Blended Learning for Teacher Professional Development
- **d.** Blended Learning Implementation
- **e.** The Promise of Blended MOOCs
- **f.** Blended MOOCs for Teacher Professional Development
- **g.** Summary and Recommendations from the Review of Existing Research

31 Recent Examples of Blended Learning in Teacher Education & Training in Europe

35 Conclusion

36 Glossary

38 References

Executive Summary

Online learning – particularly when offered at scale in the form of Massive Open Online Courses (MOOCs) – has been recognised as offering the potential to address the constant, global need for teacher training (Laurillard, 2016). Teachers are precisely the kind of busy professionals who are well positioned to take advantage of online development opportunities. Nevertheless, there are many reasons why teachers may be hesitant to study in a fully online programme.

There is no dispute across the literature that blended learning is at least as effective as learning in traditional face-to-face or online courses, with some evidence that it produces better learning outcomes. What the literature demands, however, is more attention to the specifics of the design of blended learning programmes and the way they impact teacher learning. Blended learning needs thoughtfulness in the way face-to-face and online learning are combined. While most studies indicate high levels of teacher satisfaction with a blended approach, the evidence for the value of blended teacher professional development centres around three characteristics of blended learning: reduced costs; flexibility; and the capacity to create collaborative teacher learning communities. Since the benefits of the first two themes derive largely from the online aspects of the course, it is within the third theme – teacher communities – that the most explicit benefits of combining face-to-face with online can be seen.

It is critical to consider the design of both aspects of the blended learning experience – the online aspects and the face-to-face components, and to consider the ways in which these complement and enrich each other. Within the research, attention is often given to the online aspects of the design, rather than what happens in the face-to-face classroom. This 'black boxing' of face-to-face methods may be a result of familiarity with traditional methods, but this is a weakness of the research in this area. Close analysis of the lessons learnt from five blended designs indicates a number of **strategies for blended learning implementation:**

1. **Face-to-face classes could be most effectively used** for modelling and practicing practical tasks.
2. **Building a peer learning community** can be achieved by designing collaborative online activities as part of a blended course, rather than only requiring teachers to engage with content online.
3. **There is a trade-off** between promoting online engagement in highly structured activities and providing less formal support for teachers to implement ideas in their classroom in a manner of their own choosing.
4. **Some online participation in discussion should be required**, without tightly specifying what teachers should post.
5. **Using online discussion** (visible to the whole group) for small group communication around online collaborative tasks could be effective for stimulating engagement and for the co-construction of knowledge in a blended course.

The insights from these designs could be used to design both the online and the face-to-face aspects of blended teacher education and training.

Research on blended MOOCs for TPD is limited but within the broader literature, the importance of integrating MOOCs into face-to-face provision is considered essential. There is evidence that blended learning can be effective to augment both pre-existing MOOCs and courses that are designed especially from scratch. In these situations, co-design is an important consideration to ensure the community buy-in and eventual sustainability of the MOOC. However, blending pre-existing global MOOCs brings with it major cost efficiencies, and teachers can be provided with access to a high quality learning experience and a global teaching community to share ideas. In addition, the blended approach adds a local dimension, supporting teachers to find ways of putting ideas into practice in their own schools. By including both aspects, teachers are exposed to other teachers' ideas and are then enabled to adapt and adopt them in their specific contexts. The European Schoolnet Academy – a MOOC platform for teachers – aims to build on this by exploring how to better support teachers, school leaders, and teacher training organisations to setup school-based or local infrastructures that allow teachers to take MOOCs collaboratively and within their local contexts.

The report highlights the design of blended learning implementations to support practitioners. Future researchers and practitioners should be encouraged to share clear representations of their blended learning MOOC designs in order to build up a database of evidence-informed Blended MOOC learning designs to guide practice.

Introduction

Online learning – particularly when offered at scale in the form of Massive Open Online Courses (MOOCs) – has been recognised as offering the potential to address the constant, global need for teacher training (Laurillard, 2016). As experienced learners, teachers are precisely the kind of busy professionals who are well positioned to take advantage of online development opportunities. Nevertheless, there are many reasons why teachers may be hesitant to study in a fully online programme. For example, teachers may lack familiarity with online options, or the technical confidence to embark on an online course without support. Or they may lack personal motivation and require encouragement from peers to persist with online study. In this context, a modified face-to-face learning experience may be considered as option to augment an otherwise, online course.

Such blended approach to teacher education & training is the focus of this report. It offers a review of existing research on the topic as well as a summary of three recent examples of blended learning in teacher education & training across Europe. The report is based on the outputs from the **2nd European Schoolnet Academy Thematic Seminar** held in December 2020 with the title *"Implementing Blended Learning in Teacher Education & Training – Findings from Research and Practice"*. A recording of the Seminar can be accessed here. The author of this report contributed to the Seminar as a keynote speaker.

The European Schoolnet Academy was launched in 2014 and was the first European MOOC platform dedicated to schoolteachers and other school stakeholders. In 2019 it launched an annual Thematic Seminar series for teacher trainers and policy makers addressing key topics originating from the experience of running MOOCs for teachers.

Review of Existing Research

This report presents a review of the research literature on blended learning provision for pre-service and in-service teacher education and training. The research presented here focuses in particular on in-service teacher professional development (TPD), and there may be issues that are specific to pre-service programmes that are not covered here.

The review discusses the many definitions and interpretations of blended learning and how these have changed over time. There has been a demand for more advice on designing blended learning. This review contributes to this by foregrounding the approaches to implementation found in the literature and presenting a number of blended learning exemplars, and the resulting lessons learnt, to guide practice in this area. The review highlights the importance of making blended learning designs explicit in order to reveal the thoughtfulness of the design, and the analysis of which elements and interactions are most effective. The review points to limited attention paid to the in-class or face-to-face aspects of the blended learning design.

The first part of the review explores the definitions of blended learning in the literature and their significance for understanding what is at stake when designing for blended learning. It reviews the array of terminology used in relation to blended learning. The shifting terminology for online learning is also considered.

The second part of the review focuses on the evidence of the benefits of taking a blended learning approach to TPD arising from the literature. Three themes are presented: flexibility; cost efficiencies; and collaborative learning communities.

The third section drills into the blended learning implementations evaluated in the literature and identifies a number of blended learning design exemplars. The aim of this section is to make explicit the pedagogies employed to guide practitioners. The lessons learnt from each approach are also presented.

The fourth section introduces the potential of blending MOOCs for TPD. Approaches to blending MOOCs are considered, identifying the need for close integration between the MOOC and the face-to-face activities.

The fifth section focuses specifically on blended MOOCs for TPD. Three examples are presented to begin to identify best practice for this emerging field.

a. Methodology

The methodology employed for this review involved an integrated library discovery system search which included the following databases:

- Taylor And Francis Combined Social Science And Humanities And Science And Technology 2018-2020
- KB+ JISC Collections Springer Compact 2019-2021
- ProQuest Central
- Elsevier ScienceDirect Journals
- DOAJ Directory of Open Access Journals
- Cambridge University Press Journals Current
- Emerald Insight
- Central and Eastern European Online Library – CEEOL Journals ucl
- SpringerOpen Free
- JSTOR Arts and Sciences VIII
- KB+ Jisc Collections SAGE Journals Read and Publish 2020-2022 Agreement Reading List

The search terms "*blended learning*" AND teacher education OR teacher training OR teacher professional development produced over a thousand articles published between 2005-2020, from among which 120 were selected, excluding all those that were not concerned with teacher training or professional development, did not discuss blended learning for teacher training, education or development or were focused on teacher training for blended learning but not with teacher training using blended approaches. Relevant articles referenced in these publications were added, and a further search on blended MOOCs, and blended MOOCs for teacher education was conducted. These articles were reviewed and synthesised to produce this report.

b. What is Blended Learning?

Researchers use many definitions and interpretations of blended learning, as well as competing terminology to describe it, leading to the assertion that blended learning is a "*floating signifier*" (Gynther, 2016a, p. 21). The term can be used to indicate learning experiences that combine face-to-face and online teaching methods (Ho, Nakamori, Ho, & Lim, 2016), often in contrast to fully online learning where there is no face-to-face interaction, and learners never need to be in the same place:

> *[blended learning is] a combination of face-to-face experiences, in which learners are co-located, with online experiences, where learners are not at the same location. (Owston, Wideman, Murphy, & Lupshenyuk, 2008, p. 202)*

Early attempts to define the term even went as far as specifying the percentage of the experience that was spent online – i.e. not less than 20% nor more 79% (Allen, Seaman, & Garrett, 2007). However, concern with precise proportions tended to be eschewed by later researchers (Owston et al., 2008). Instead, such definitions are challenged for their lack of detail about what happens within or between the face-to-face and online elements, and as a result, some authors claim that this can be misleading (Means, Toyama, Murphy, Bakia, & Jones, 2012), arguing that the definition should account for the "*instructional elements of the two conditions*" (Means et al., 2012, p. 38).

The reasons for this are that blended designs can range from digital technologies simply being "*bolted on*" to a traditional learning experience (Owston et al., 2008, p. 202), to much more sophisticated designs that exhibit a thoughtful integration of the two modes (Garrison & Kanuka, 2004; Paskevicius & Bortolin, 2016). Reflecting on what thoughtful might mean in this context, (Laurillard, 2014, p. 10) proposed that blended learning should be considered:

> *'thoughtful' because technology is complex and continually changing. It must be a thoughtful 'integration' because the digital is not a supplement, and does not simply replicate aspects of the conventional – each should enhance the other*

To be able to assess the degree of thoughtfulness in terms of both use of technology and integration of face-to-face and online elements, therefore, it is necessary to specify precisely the activities involved in each part. Nevertheless, as will be demonstrated below, this is very often not the case within the research. Instead, there are degrees with which authors unpack these elements, often being much more specific about the online part, and less so about the traditional, face-to-face experience. While this may be explained by the greater familiarity among teachers and students about what happens within a traditional classroom, unless details are provided, it is impossible to assess the integration of each mode.

Within the broader term, blended learning, there are certain models or design patterns that have emerged. For example, Krasnova & Shurygin (2019, pp. 17-18) identify the prevailing models of blended learning as including:

> *Rotation models (Station Rotation, Lab Rotation, Individual Rotation, Flipped Classroom), Flex model, A La Carte model, Enriched Virtual model.*

Rotation models are designed to shift the learning between face-to-face and online according to a fixed schedule, while the flex model offers a primarily online learning experience supported by a teacher available in class (Burns, 2011). The flex model involves offering a combination of online and face-to-face learning to provide a student with a flexible schedule, while the a la carte model offers the opportunity to take an online course in addition to other face-to-face courses. The enriched virtual model offers a primarily online experience, with students attending face-to-face classes for support (Clayton Christensen Institute, n.d.). However, it is only the flipped classroom model that appears with any regularity elsewhere in the research literature (Brahimi & Sarirete, 2015; Graziano, 2017; Kurt, 2017; Li et al., 2014; Turan & Göktaş, 2018; Van Wyk, 2019), and is often included in the discussions of blended MOOCs (Bruff et al., 2013; Dale & Singer, 2019; Pérez-Sanagustín, Hilliger, Alario-Hoyos, Kloos, & Rayyan, 2017a; Pérez-Sanagustín, Hilliger, Schwarzenberg, & Parra, 2015).

This approach is specified by (Graziano, 2017, p. 121) as involving the educator in the creation of instructional video or audio recordings (e.g. screencasts or podcasts) that are provided to students for watching or listening online outside of class time, thereby *"freeing up valuable class time for more engaging and collaborative activities"*. Turan & Göktaş, (2018) clarify that a flipped approach in a subset of blended learning models involving the rotation or switching of the content acquisition that would traditionally be completed in class with the kind of activities that might be ordinarily associated with homework (e.g. practical activities). In this model, however, careful design of both elements is as important as other blended designs in order to achieve any kind of thoughtful integration, yet there is little detail provided in the research.

The term hybrid learning is also used in the research literature to designate the combination of face-to-face and online teaching. The term can be used interchangeably with blended learning (e.g. Brysch, 2020). However, it is also used by authors (e.g. Clary, Dunne, James, et al., 2017) when referring to the blend of online learning with periods of intensive, residential face-to-face learning, for example at summer schools. This could also be seen as a rotation design. On other occasions, however, hybridity is used to include support by video conference along with face-to-face classes as a blended MOOC design (Pérez-Sanagustín, Hilliger, Alario-Hoyos, Kloos, & Rayyan, 2017b). The rapid shift to online teaching that has been necessitated by the Covid-19 pandemic has contributed additional meanings to the term 'hybrid', to refer to the educator's simultaneous engagement with *"a mixture of students attending on-campus and digitally"* (University of Edinburgh, 2020, para 18).

A further term that appears in the literature is flexible learning (Kupetz & Ziegenmeyer, 2006; Smith & Hill, 2019). This term is used alongside blended learning to describe the same experience (Ashton & Elliott, 2007; Toci, 2016), perhaps as a way of indicating the predominant value of the blended design (see below).

Shifting terminology also surrounds the online part of a blended learning design. Early research on blended learning were more focused on the role of digital tools to support online communication and collaboration as a supplement to a face-to-face course, for example using wiki technology (Hramiak, 2010; Robertson, 2008). However, as the technological capacity for wholly online courses has developed, it has become more typical for face-to-face courses to be offered in combination with an online course. The MOOC phenomenon both raised the profile of online learning and its potential for TPD (Yurkofsky, Blum-Smith, & Brennan, 2019), particularly, perhaps, among those who were unaware of the smaller, closed course formats in which it had previously existed.

Despite the shifting terminology there is no dispute across the literature that blended learning is at least as effective as a traditional or online course, with some evidence that it produces better learning outcomes (Owston et al., 2008). What the literature demands, however, is more attention to the "*various designs of blended programs and their impact on student learning*" (Owston et al., 2008, p. 209). For this to happen, researchers need to be more precise about the nature of the blended design they are examining. This will also be helpful to practitioners who find it challenging to implement blended learning without detailed guidance, resulting in calls for more blended learning design, implementation and analysis guidelines (Alonso, López, Manrique, & Viñes, 2005; Boitshwarelo, 2009).

The literature review that follows, therefore, will present the themes that arise from literature on blended learning, focusing on blended learning TPD programmes in general, before examining blended learning designs centred around MOOCs in particular. The emphasis will be on approaches to implementation. To make this most helpful to the practitioner seeking support to implement their own blended learning TPD programmes, the review pulls out a number of exemplars from the literature, each demonstrating different approaches to blended learning and examines the lessons learnt from each one. The aim is to offer practical guidance to construct effective blended learning around online activities, particularly in relation to MOOCs.

c. Key Findings: The Benefits of Blended Learning for Teacher Professional Development

While most studies indicate high levels of teacher satisfaction with a blended approach, in terms of both the learning experience and the development of professional skills (for example, Biasutti, Frate, & Concina, 2019; Doğan & Gülbahar, 2018; Ho et al., 2016; Kurt, 2017; Moriña, 2019; Yılmaz & Malone, 2020) the evidence for the value of blended teacher professional development centres around three characteristics of blended learning:

- Flexibility
- Cost efficiencies
- The capacity to create collaborative teacher learning communities

A large number of research articles focus on designing ways to support communication and community in blended TPD programmes as this is considered both central to creating effective TPD but also the key feature of a blended approach that differentiates it from a fully online course. Thus, the perceived shortcomings of fully online TPD are also reasons for adopting blended learning in the research literature, which shows that a blended approach can be effective in creating a sense of community among teachers. Teacher satisfaction with a blended approach is core to claims for its effectiveness, while knowledge gains for participants in blended learning compare well to traditional modes (Means, Toyama, Murphy, Bakia, & Jones, 2009; Means et al., 2012). Disadvantages are considered similar to those for fully online programmes, and centre on issues of *"equity, access, and availability of infrastructure"* (Brysch, 2020, p. 56).

Flexibility

Blended learning offers teachers much more flexibility than face-to-face classes, since barriers to attendance arising from time or location constraints are either removed or reduced (Brysch, 2020). As teachers increasingly struggle to make room for professional development in their extremely busy schedules (Moriña, 2019), the advantage of not having to attend a regular face-to-face session can be critical. What precious time teachers do have available can be maximised for professional learning, for example, while travelling:

> *I watched the lectures whenever I wanted – sometimes while travelling on the bus, sometimes while playing a game or eating (teacher quoted in Kurt (2017, p. 217).*

The flexible mode of attendance can allow in-service teachers to participate in university teacher training courses alongside pre-service teachers, creating valuable interconnections throughout the stages of teacher training (Kimmelmann & Lang, 2019). These connections can provide access to academic discussion

for in-service teachers and enable pre-service teachers to learn from the experience of practicing teachers.

Blended designs also mean that TPD programmes can be based in teachers' schools (Owston et al., 2008) which could provide increased opportunities for application to practice and to develop teacher learning communities with colleagues. Brysch (2020) reported that teachers considered having an online component to a blended professional development a necessity because of the flexibility it offered and the blend of different modes increased the potential for implementation and sharing:

> *One teacher explained that teachers could first watch the online video components of the Stars program, implement them in their classrooms, and then meet with teachers face-to-face to continue the conversation regarding the interaction with the materials (Brysch, 2020, p. 60).*

The benefits of flexibility do not only extend to allowing teachers to attend development sessions, therefore, but to engage in authentic learning tasks (Herrington, Oliver, & Reeves, 2003) because of their constant location within the site of their professional practice.

Cost Efficiencies

In addition to the flexibility offered by blended learning, researchers point to the cost savings involved in shifting much of the learning experience online and reducing the number of face-to-face meetings (for example, Ho et al., 2016; Marrinan, Firth, Hipgrave, & Jimenez-Soto, 2015; Qasem & Viswanathappa, 2016; Seraphin, Philippoff, Parisky, Degnan, & Warren, 2013). Cost savings arise from various points in the delivery cycle. On the part of the provider, the creation of online components require heavy investment up front, but thereafter can be offered to multiple cohorts over multiple runs (Kennedy, Laurillard, Horan, & Charlton, 2015) requiring institutions to rethink their financial planning models (Bates, 2000). Twigg (2003) reported that in a university level course redesign programme in USA, cost savings derived from replacing higher salaried teaching staff with less experienced, therefore cheaper, teaching assistants to moderate the courses. The resulting economies of scale (Bates, 2001) can have enormous benefits to governments facing increasing demands for retraining and professional development of the workforce (Marrinan et al., 2015). Marrinan (2015) refers specifically to training health care workers in the Global South, but these insights can also be applied to training the global teaching workforce (Kennedy & Laurillard, 2019).

Savings also result from teachers not needing to travel to attend TPD sessions (Boitshwarelo, 2009). Contemporary life requires a complex balance between study, work and family commitments, and travelling large distances is both a burden on finances and time (Ashton & Elliott, 2007), and can act as a disincentive to engage in professional development (Goos et al., 2020). Moreover, the COVID-19 has demonstrated that travel may become impossible for sustained periods.

Reducing costs can also have a beneficial effect on the quality and duration of a professional development experience. In a study of a blended professional development programme for science teachers in Hawai'i, (Seraphin et al., 2013) found that the online components were able to extend teachers' engagement in the programme, something which had previously been impossible despite organisers' desire for post-course follow-up because of the high cost of interisland travel. Cost reductions linked to reduced travelling are most significant for rural teachers, where blended approaches can increase access and enable upskilling of dispersed workforces (Fresen & Hendrikz, 2009; Kitchenham & Chasteauneuf, 2010; Onguko, Jepchumba, & Gaceri, 2013).

Collaboration and Community

The third theme that arises from the literature is the capacity for blended learning to create opportunities for communication, collaboration and community among teachers. The previously discussed benefits of flexibility and cost efficiencies associated with blended learning arise from the online aspects of TPD programmes, and are similarly reported for fully online learning (Anshari, 2015; Laurillard, 2011; Meyer, 2014). These benefits are therefore not unique to blended learning. What is distinctive about blended learning pedagogy is the integration of face-to-face elements which could be argued undermine the benefits of flexibility and cost savings. This is because attendance at a designated location at specific times restricts blended solutions to those capable of travelling. In addition, blended learning sessions are impossible to scale, since physical spaces are necessarily limited and the need for a viable trainer-student ratio adds costs to the online elements. The reduction in face-to-face attendance mitigates this to some extent, but not completely. The inclusion of face-to-face development sessions, are, however, argued within the literature to be central to the quality of blended TPD, and are justified because of this.

The need for quality professional development for teachers to build community is acknowledged by most of the literature:

> *Research has also shown that effective professional development provides on-going support to teachers as they seek to implement new ideas in their classrooms (Anderson, Boaler, & Dieckmann, 2018, p. 3)*

Designers of blended learning experiences seek to create community support to mitigate the isolation felt by many teachers (Hoffmann-Dumienski, 2016; Hramiak, 2010; Trust & Horrocks, 2017). While online engagement was often designed to create a sense of community, the ability to meet face-to-face was considered to facilitate or enrich online interactions:

> *At every stage of the course the blended course design was significant in the creation of a course community. The establishment of an online presence in group activities by each course participant in Module 1 enabled everyone to start building online relationships. The initial face-to-face session enriched and encouraged this as participants met other course participants they did not already know. (Evans, Yip, Chan, Armatas, & Tse, 2020, p. 648)*

Studying in an online or blended environment with known colleagues was preferred and enabled different kinds of peer support (Philipsen, Tondeur, Pareja Roblin, Vanslambrouck, & Zhu, 2019). Researchers reported that having opportunities to meet and engage in group activities during face-to-face sessions were highly valued by participants, for example:

> *the opportunity of meeting and getting to know other colleagues was a personal enrichment as stated in this quote: 'We get to know our colleagues better, because in the forum I read what my colleagues have written, I also try to put myself in their shoes, to understand their way of doing certain things.' (Biasutti, Frate, & Concina, 2019, p. 126)*

In situations where online engagement was impossible (because of poor infrastructure) the face-to-face sessions were designed to compensate and create this community (Boitshwarelo, 2009). In addition, many of the studies lament the lack of participation of teachers in online discussion activities (Holmes, Polhemus, & Jennings, 2005; Owston et al., 2008; Voogt, Almekinders, Van Den Akker, & Moonen, 2005). Some researchers pointed directly to the need to mitigate the perceived shortcomings of fully online environments to create a sense of trust between participants (Owston et al., 2008;

Vrasidas & Hadjisofoclis, 2015) while others saw face-to-face as adding value by engaging learners *"in advanced interactive experiences"* (MIRONOV et al., 2014, p. 228).

It is critical therefore to consider the design of both aspects of the blended learning experience – the online aspects and the face-to-face components, and to consider the ways in which these complement and enrich each other. There have been calls for more guidance on the pedagogical design of blended learning (Boitshwarelo, 2009; Smith & Hill, 2019; TAMI, 2016) since there is often insufficient clarity on the ways each method is designed to reinforce the other (Clary, Dunne, et al., 2017). While the method of implementation of blended TPD is a focus of much of the existing research, attention is often given to the online aspects of the design, rather than what happens in the face-to-face classroom. For example, Mironov et al. (2014) provide rich detail on what happens online, but much less on activities in the face-to-face sessions. Similarly, Doğan & Gülbahar (2018) report on the use of a closed Facebook group for supporting peer assessment and knowledge sharing activities, but neglect to specify the role or content of the face-to-face workshop activities. This 'black boxing' of face-to-face methods may be a result of familiarity with traditional methods, but this is a weakness of the research in this area. Since the face-to-face components are what distinguishes blended learning from online learning, and reduce the potential for flexibility and cost efficiency that could be achieved with online learning only, it is important to specify exactly how the two modes of learning experiences are designed in relation to each other.

The next section therefore aims to identify the learning designs of blended learning implementations selected from the research literature in order to shed light on the ways that blended and online modes can be designed interact effectively.

d. Blended Learning Implementation

The literature is in broad agreement over the benefits of blended learning. However, there have been calls to make more explicit pedagogical approaches to blended learning (Alonso et al., 2005; Boitshwarelo, 2009; Owston et al., 2008) to examine more closely the impact of the relationship between the various elements of face-to-face and online learning experiences. The novelty of online aspects of blended learning has meant that more detail is often available for digital or online activities involved than what happens face-to-face. Nevertheless, it is sometimes possible to gather a sense of the overall blended designs used in the research studies reviewed. This section, therefore, attempts to represent these as learning designs that may help to guide implementation.

The learning designs that follow present blended learning exemplars from the last 15 years or so of research on blended learning TPD. These include learning designs from the beginning of this period to demonstrate both the ways that blended learning design has evolved, but also to capture the lessons from these original implementations. Early blended designs relied less heavily on structured online resources in the form of online courses or MOOCs. As a result, the online part of the blend involved online collaborative activities rather than consulting resources. Since researchers have noted teachers' lack of participation in online discussion, there may be lessons here for ways of encouraging that participation away from the face-to-face sessions. Later designs incorporate more explicit learning community and knowledge co-construction goals and activities and embed ways of sustaining the community beyond the end of the course.

Technology Integrated into a Face-to-Face Course

An early example of designing technology mediated collaborative activities into a predominantly face-to-face teaching diploma course for both in- and pre-service vocational teachers is provided by Robertson (2008).

Design		
8 weeks face-to-face lectures and tutorials	Assessment	5 weeks problem-based small group activity comprising: 1 week induction to wiki in class, followed by 4 weeks face-to-face planning meetings and post-class online contributions to wiki

In this session the online element supports the co-construction of a training plan, which is then submitted via the wiki. This is different to later models, since there is no online teaching, simply an induction to the technology for collaboration. The induction takes place in class, but subsequently the technology is only used outside class time. Instead, the teachers are invited to use the class time to meet, discuss and plan their contributions to the wiki and meet with the tutor. This design gives greater attention to the design of face-to-face activities than many of the later blended designs.

Lessons learnt

While some of the teachers were disappointed with the technical limitations of the wiki, half of them saw potential for using wikis in their own teaching. Wikis still exist, albeit largely embedded in learning management systems rather than as standalone tools. Nevertheless, they may be seen as tools of the past, and were perceived by the teachers in this study as limited. However, this design can be viewed as a prototype for using technology for connection, communication and collaboration between face-to-face sessions, rather than for instruction. Tools such as social media platforms (e.g. Doğan & Gülbahar, 2018) may be considered to fulfil a similar function in more recent studies, but with less capacity to support co-creation.

Three Learning Communities: Structure vs Informality

Owston et al. (2008) provided details of three blended programmes for in-service teachers. Two of the designs (ABEL and TeL – detailed below) were fairly similar, allowing for online exploration and ending with a face-to-face summer institute which were eventually combined into one event. The final design was more structured than the others with more details provided of face-to-face and online activities.

Design 1: ABEL (Advanced Broadband Enabled Learning Program)

Online platform tools made available	Periodic video conferences with experts	5 day face-to-face summer institute

Design 2: LC (Learning Connections project)– similar to ABEL but more formal

Online platform tools made available	Online discussion and activities for teacher implementation off-line facilitated by mentors	Periodic video conferences with experts	5 day face-to-face summer institute

Design 3: TeL (Teacher e-Learning Project TeL)

1 day face-to-face session with tutor presentation on ideas for improving teaching followed by small group discussions about implementation	8 weeks online interaction with weekly readings and activities to try out off-line, online discussions and an online reflective journal [repeated 3 times then redesigned to be repeated twice because of toll on teachers' time]

Lessons Learnt

Owston et al. (2008) found that the more structured the design, the more challenging it was for teachers to experiment with ideas in their classrooms. However, a lack of structure resulted in less engagement in online activities. They concluded that *"developers of blended programs need to be aware of these trade-offs when designing the overall structure of a program"* (Owston et al., 2008, p. 209). Moreover, while the designs aimed to create community among teachers, this only existed for the duration of the courses and did not emerge into a sustained community of practice. Reducing the time between online and face-to-face activities was found to be better than having a concentrated face-to-face period like a summer institute.

Online Discussion for Knowledge Construction: Required but not Prescribed

In the context of an initiative to support the use of technology by teachers in Iran, Nami, Marandi, & Sotoudehnama (2018) report the use of an online discussion group to support teachers to co-construct knowledge. Their project aimed to investigate patterns of interaction and cognitive, social and teacher presence.

Design

Face-to-Face › Computer Lab › Face-to-Face **+** Ongoing participation in online discussion list

The implementation of blended learning involved 13 two-hour sessions, which included 7 face to face meetings which introduced participants to technologies and their use in the classroom, combined with 6 sessions online, which took place in a university computer lab, and tasks to do at home. For these, participants were asked to review technological tools and share their findings in audio, video or written reports and take part in a Yahoo discussion group. Teachers were told that these contributions were a requirement to pass the course, but no further instructions as to number, frequency or content were given.

Lessons Learnt

The authors report success in engaging the teachers to use the discussion to co-construct knowledge as they asked questions of each other and shared solutions. This is one of few studies that include technology mediated activities within the class, albeit in a computer lab. However, developments in technology and the pervasiveness of broadband wifi, laptops, tablets and mobile phones support easy in-class technology use. It is noteworthy that the designs do not focus on the incorporation of technology into class time as a mechanism for integrating face-to-face and online activities.

Discussion in Dual Mode

A quasi-experimental approach was adopted by Ho et al. (2016) to compare the effectiveness of a blended approach to a traditional face-to-face course for in-service secondary school teachers in Vietnam. Their aim to create an environment conducive to knowledge management and construction.

Design

Online self-paced learning	Tutor facilitated discussion forum activities	Face-to-face discussion in small groups and peer reviewed presentations	Reflective assignment posted online	Online test	Ongoing online peer discussion

A needs analysis was undertaken prior to running the course, and online self-study materials were co-created with the teachers. Individual self-paced study of online materials was followed by online discussion activities. Teachers were also brought together in face-to-face sessions which were also focused on peer sharing through small group discussions and presentations with peer feedback. Teachers went back online to post a reflective journal based on collaborative assignments and undertake tests and continued to take part in an online community discussion.

Lessons Learnt

The authors found that teacher knowledge and satisfaction with the course overall was higher in the blended course, and on a par with the traditional course for self-efficacy. Participants in the blended learning considered they learnt most from online lectures (60%), supplementary materials (51%) but also from discussion with peers (40%), which along with qualitative comments, provided evidence of the creation of a teacher network. Participants reported having sufficient time for reflection and practice, and they enjoyed the flexibility of the course (91%) and the cost savings (60%). Nevertheless, the traditional version of the course produced slightly higher results for self-efficacy leading the authors to conclude that face-to-face sessions can offer more practical support for teachers' self-efficacy. This finding indicates the role that the face-to-face part of a blended design could most effectively play – that is, that face-to-face learning opportunities might best be dedicated to modelling and practicing practical activities.

Teachers as Co-designers

The approach adopted by Papanikolaou, Makri, & Roussos (2017) created social learning opportunities around collaborative design activities. This was an attempt to synthesise features of the Technological, Pedagogical and Content Knowledge (TPACK) framework and the Community of Inquiry (CoI) model. The authors ran the course twice changing the design in response to a lack of participation in online discussion and challenges faced by the teachers progressing from simpler tasks to more complex ones.

Design: Run 1

Face-to-face technology/design focused workshops	Individual activities	Exploration of online design environments	Face-to-face and online small group discussion and collaboration [pattern repeated throughout course]

Run 2 (Redesign)

Face-to-face workshops	Online platform exploration	Collaborative design challenge activities in small groups via online discussion forum visible to whole group

Lessons Learnt

The course engaged pre-service teachers in a series of design challenges to support the collaborative design and development of a technology-enhanced course. In the redesigned second run of the course, group interaction was supported by a tutor moderated online forum with specific threads per small group enabling the whole class to view other groups' design decisions and enable peer review. The authors compared students' knowledge before and after the course through questionnaires in run 2 and reported increase in pedagogical and technological knowledge. There was also greater engagement in online discussion in run 2 following the redesign. However, this created greater demands on the educators to moderate the discussion.

Summary

Close analysis of the lessons learnt from these five blended designs indicates a number of helpful strategies for blended learning implementation. The first design *"Technology Integrated into a Face-to-Face Course"* showed that a peer learning community can be achieved by designing collaborative online activities as part of a blended course, rather than only requiring teachers to engage with content. Technical issues can be avoided by introducing the task and technology in the face-to-face course. The lessons learnt from a comparison of the designs in *"Three Learning Communities: Structure vs Informality"* demonstrated the trade-off between promoting online engagement in highly structured activities, and providing less formal support for teachers to implement ideas in their classroom in a manner of their own choosing. This research also showed participation in an online teacher network disappeared at the end of the course, perhaps indicating that if this is a goal, then it too needs to be carefully designed into the blended programme. The authors advised to create short time intervals between different modes of learning.

A possible way of responding to the structure vs informality tension is provided by *"Online Discussion for Knowledge Construction: Required but not Prescribed"*. Lessons learnt here involved adding some required online participation in discussion, without tightly specifying what teachers should post. This approach is in line with observations that formulaic discussion board tasks can be less effective than asking open ended questions (Lieberman, 2019).

"Discussion in Dual Mode" also demonstrated the power of engaging teachers in online discussion, and indicated that face-to-face classes could be most effectively used for modelling and practicing practical tasks. Finally, *"Teachers as Co-designers"* demonstrated that using online discussion (visible to the whole group) for small group communication around online collaborative tasks could be effective for stimulating online engagement and for the co-construction of knowledge.

The insights from these designs could be used to design both the online and the face-to-face aspects of blended teacher education and training. In some of the designs, the teaching content was provided face-to-face only, with online being used for discussion and collaboration activities, while others used online materials as part of the blend. None of the designs made use of MOOCs, which could provide access to both content and engagement, indicating that these designs could also be used in combination with MOOCs. The next section reviews the ways that MOOCs are being blended into face-to-face courses with a view to identifying how blended TPD could make use of MOOCs.

e. The Promise of Blended MOOCs

MOOCs are freely available online courses with large numbers of participants that are hosted on platforms designed to support students engaging from all over the world who are not necessarily enrolled at a host institution. There is a growing body of research on the use of MOOCs as part of a blended learning programme. So far, this has largely focused on blended MOOCs for undergraduate students, but research on blended MOOCs for TPD is gradually emerging. This section considers the lessons from blending MOOCs in general, before examining blended TPD MOOCs in detail.

The MOOC phenomenon dates from around 2012, designated by The New York times as "*the year of the MOOC*" (Laura Pappano, 2012). Experiments by a few top universities encouraged many others to try out free online courses that, because of their novelty, attracted 10s of 1000s of participants, leading many commentators to believe that they could open up university level study to the masses. However, data on participation began to show that MOOCs were attracting already experienced learners with degrees or postgraduate degrees (Hollands & Tirthali, 2014). MOOCs were not, therefore, the solution to scaling up undergraduate education.

MOOCs also repeatedly showed what appeared to be high drop out rates, as they retained fewer and fewer participants as the course progressed. Research indicated, however, that it was inappropriate to compare MOOCs to undergraduate courses in this regard, since participants had very different motivations and intentions than course completion (Kizilcec & Piech, 2013). The reason given for disengagement has always been lack of time (Kizilcec & Halawa, 2015), indicating that participants find that their other commitments gradually take precedence, particularly as MOOCs rarely offer formally recognised qualifications, and require no financial investment on the part of the learner. Interestingly, courses with certificates endorsed by professional associations fare better in this regard (Laurillard & Kennedy, 2020).

The massiveness of MOOCs presents challenges for creating the conditions necessary for learning insofar as the educator cannot provide individual feedback to each learner. For early MOOCs, which relied heavily on lecture-style 'talking head' videos, this was a particular issue. However, the development of MOOC pedagogy has given more attention to peer learning, in the form of discussion and collaboration activities. These, along with quizzes and tests, can provide feedback to participants and potentially compensate for the lack of educator feedback. To benefit from this kind of independent + peer-to-peer learning, however, learners require a high level of pre-existing self-regulation (Laurillard & Kennedy, 2020). This both

explains why MOOC participants are typically well-qualified professionals and why educators have experimented with blended MOOCs to offer more support to learners.

In general, student performance in blended MOOCs is reported as equivalent to or slightly better than studying online only (Dale & Singer, 2019). However, blended MOOC design has the advantages of compensating for the perceived weaknesses of the MOOC model. These include the high drop out rates (Yousef, Chatti, Schroeder, & Wosnitza, 2014) and the lack of capacity for individual tutor assessment. Blends have been implemented in some cases to compensate for the top-down, teacher-centred pedagogy of early MOOCs, lack of engagement with the material and the challenges of providing adequate assessment (Almutairi & White, 2018; Yousef, Chatti, Schroeder, & Wosnitza, 2015). Blended MOOC designs have varied from a fairly loose blend based on the flipped classroom concept – such as setting up study groups for participants to study or watch videos together from existing MOOCs (Bayeck, 2016; Li et al., 2014) to designing the MOOC with a blended delivery in mind (Dale & Singer, 2019; Gynther, 2016b; Swinnerton, Morris, Hotchkiss, & Pickering, 2017).

Early attempts to integrate MOOCs into traditional, in-class university education has been described as "*wrapper approach*" – that is, a face-to-face course is wrapped around an existing external MOOC (Bruff, Fisher, McEwen, & Smith, 2013, p.190). Bruff et al. (2013) directed students to a MOOC running during their on-campus postgraduate class and invited them to watch the videos that roughly aligned to topics they discussed in class, supported by readings of research papers. Students were enthusiastic about the MOOC videos and, although they did not engage in the online discussion, they found the discussion helpful. By contrast, students found the research articles discussed in class less clear, and requested more discussion of the MOOC material in class, which was preferred to lectures repeating the same material. Similar results from other MOOC blends were reported by Israel (2015) and (Chingos, Griffiths, Mulhern, & Spies, 2017). The authors were concerned that disadvantaged students might perform less well if classroom time were reduced, since prior studies on online courses had reported lower student outcomes for this group. However, neither study found that any negative effects arising from reduced classroom time for any group.

Bruff et al. (2013) highlighted challenges of designing the blend, i.e. getting the degree of coupling and cohesion right between the MOOC and the on-campus course, and of aligning the timing of the MOOC run with that of the class. MOOC platforms have made changes what were originally rigid scheduling of MOOCs (Coursera, 2016; EdX, 2020; FutureLearn, 2020), which has facilitated the blending of MOOC content into face-to-face classes. Although scheduling still remains a factor for some platforms (particularly FutureLearn) current blended designs need to rely less heavily on fortuitous timing of the course and the MOOC. In addition, many platforms offer MOOC educators' private runs of MOOCs, sometimes known as SPOCs (Small Private Online Courses) (Freitas & Paredes, 2018). In many of the examples provided in the literature, the term SPOC is also used to describe what was once considered simply an online course (Gynther, 2016b; Haggard & BIS, 2013; Yu, 2015). Another term introduced by Gynther, (2016) is "*Little Open Online Course*" (LOOC) to refer to a small MOOC, who rather confusingly also uses the (possibly more communicative) term "*small MOOC*". It is not always clear, therefore, that the research is discussing issues specific to blending MOOCs per se or simply to blended learning in general.

What remains at stake in designing the blend, however, is the role that additional support can provide. For example, encouragement and support at the early stages of a blended MOOC was found to increase retention which led to improved results (Firmin et al., 2014a). Holotescu & Carmen Holotescu, Gabriela Grosseck,

Vladimir Cre□u (2014) conceive of approaches blended integration in terms of the degree of synchronization of MOOC content with the course syllabus, and argue that an effective blend (which supports students to engage in discussion and collaboration within class as well as within the MOOC) can add "*connectivist and constructivist dimensions and values*" (p. 249) to create a local learning community around a MOOC.

Various frameworks have emerged to describe and guide the design of blended MOOCs. Delgado Kloos, Muñoz-Merino, Alario-Hoyos, Estévez Ayres, & Fernández-Panadero (2015) documented six models:

1. **Local digital prelude:** SPOC followed by face-to-face study.

An example of this model is preparation for study courses where students take a small, private online course before attending a week long face-to-face class, where the educators are able to build on the previous learning in the SPOC. The benefits of this approach were that it extended the study time because the one-week face-to-face course was found to be too short to help students build their skills. A combination of Khan Academy and Moodle was used for the course, and learning analytics helped educators understand where students needed most support.

2. **Flipping the classroom:** SPOC undertaken at home while class time is devoted to engaging with and reinforcing content.

A second year computing undergraduate course for 100 students is provided as an example, where theoretical concepts and automated assessment is conducted online prior to face-to-face classes that focus on programming problems, followed by lab sessions where students work first in pairs, then in teams.

3. **Canned digital teaching with face-to-face tutoring:** MOOC contents are used independently as revision materials with individual tutorials available.

The authors refer to these courses as reinforcement courses or R-courses. They cover the entire curriculum of a degree using screen and voice recorded video lectures and automated correction exercises using the OpenEdX platform because of its exercise and assessment functionality. These courses enable students to revise for examinations when no dedicated teaching is available.

4. **Canned digital teaching in face-to-face courses:** SPOC contents used as textbooks in traditional courses.

These courses are termed Blended Courses or B-courses by the authors who provide a number of undergraduate programming courses as examples. They are delivered at the same time as the face-to-face courses and are similar in structure to the previous example using screencast videos of different types and automated exercises. Students attend face-to-face classes and can carry on studying using the online course at home at their own pace.

5. **Live teaching with remote tutoring in face-to-face courses:** additions to traditional courses from guest educators from MOOCs.

A Master's computing course is provided as an example, where students build a platform for networked communities. External industry professionals are invited into the course every two weeks via video conferencing to allow students to interact with the experts.

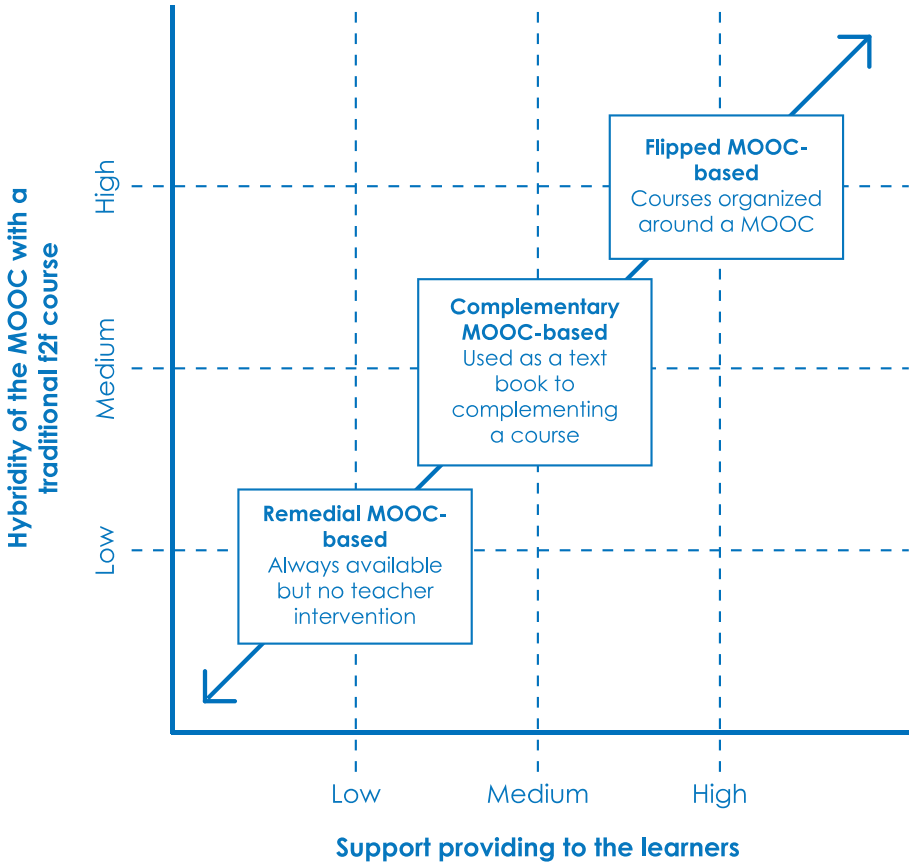
6 **Canned digital teaching with remote tutoring and face-to-face seminars:** fully online MOOC-based courses with additional tutoring via live video conferences.

For a Master's course in management aimed at practising teachers and trainers, screencast video lectures created by tutors were combined with exercises as described above to create a fully online course with a geographically dispersed student body. Additional tutoring is provided via video conferencing. In addition, seminars are also available to those who are able to attend in person.

It is notable that the examples given to illustrate these blended designs do not make use of the open, scaled up MOOC concept. Rather, these examples use either SPOCs created on MOOC platforms (e.g. OpenEdX) or online courses using Moodle, supplemented in one case by Khan Academy. Reflecting on these different models of blending MOOCs into face-to-face teaching, Pérez-Sanagustín, Hilliger, Schwarzenberg, & Parra (2015) identify three pedagogical categories which exist across a continuum of hybridity and institutional support for learners (Figure 1). The extent of the hybridity is the placement of a blended MOOC on this continuum related to the degree of integration of the MOOC within face-to-face teaching at an institution:

A MOOC that is unlinked to a particular course but is always available to the students describes a low level of integration, despite of including resources related with on-campus courses topics. A MOOC that is used by professors as a complementary resource for the course describes a medium level of integration. A high level of integration implies that professors organize their classes around the MOOC, which is used as the main reference of the course (Pérez-Sanagustín et al., 2015, p. 7).

Figure 1: A framework of hybrid MOOC-based pedagogies (from Pérez-Sanagustín et al., 2015)



A remedial MOOC-based blended implementation implies little or no integration, whereas a complementary MOOC-based implementation blend has medium level integration, such that MOOC learners can consult tutors and have mechanisms to monitor their progress. A high level of integration is where courses or classes are specifically organized around a MOOC to support the students' progress (Pérez-Sanagustín et al., 2015).

To support institutions to select which model would work best for their purposes, Pérez-Sanagustín, Hilliger, Alario-Hoyos, Kloos, & Rayyan (2017) have proposed the H-MOOC framework. This framework considers two factors should inform the blend: the level of institutional support necessary and the degree of alignment between the blended MOOC and the content of the curriculum. Variations in these two factors produce **4 ways of viewing the role of a blended MOOC:**

1. **The MOOC provides a service or additional support for students** (low institutional support, low curricular alignment).
2. **The MOOC provides a replacement for the traditional course** (low on institutional support, high on alignment).
3. **The MOOC is a driver for the course**, where a course is wrapped around the MOOC (high institutional support, high curricular alignment).
4. **The MOOC provides added value as an optional extra** but with institutional support in the form of supplementary tuition and activities (high institutional support, low curricular alignment).

These models provide an overview of the extent of integration of the blended implementation within an institutional course offering, with some, albeit limited, details about what the blended implementation would look like.

f. Blended MOOCs for Teacher Professional Development

The research on blended MOOCs is very limited. Despite this, MOOCs have been considered as offering potential for scaling up TPD (Castaño-Muñoz, Kalz, Kreijns, & Punie, 2018; Laurillard, 2016). Teachers are good candidates for MOOC participation because of their regular use of the internet for finding information (Castaño-Muñoz et al., 2018) and their good fit with the ideal profile of a MOOC participant as employed professional who are self-regulated learners experienced at independent and peer-to-peer learning (Gynther, 2016b; Laurillard & Kennedy, 2020).

To address the global shortage of trained teachers, researchers have noted that MOOCs could offer professional learning experiences to tens of thousands of participants (Laurillard & Kennedy, 2017). Gynther (2016) identified a need for TPD at scale in Denmark when primary teachers were newly required to gain a BA in their teaching subject. There were complex criteria for the MOOC that was developed in response, however, including multiple learning pathways and a mechanism to compensate for MOOCs' inability to provide individual tutor feedback for all participants in all pathways. The authors highlight the need, therefore, for an adaptive MOOC design that embedded *"asynchronous teacher telepresence"* (Gynther, 2016, p. 20) meaning that the online course was designed to convey a sense of teacher presence through video formats that personalised the teacher. However, this remained a challenge to achieve, and so a decision was made to include supplementary, blended sessions where participants could experience synchronous teacher presence both online and face-to-face. Since there is little guidance for providing MOOCs in a blended context, (Gynther, 2016b) adapted the Community of Inquiry framework. The adaptations were necessary because the content was not common to all participants, but personalised according to learning pathways. The role of face-to-face support, therefore, in their blended design was *"to support asynchronous teacher presence"* (Gynther, 2016, p. 22) and elaborate on and give differentiated feedback to students in areas they have difficulty.

Despite these design decisions, however, the MOOC participants appeared largely unhappy with the MOOC design:

> *Data from interviews and observations show that the design is very far from students' experience with ongoing education and teacher professional development. Particularly the lack of teacher presence in the MOOC and especially the lack of teacher feedback is considered challenging. Peer to peer response activities are not perceived as a qualified replacement of teacher feedback, and the MOOC teachers have had difficulty explaining why this kind of feedback is meaningful (Gynther, 2016, pp. 26-27)*

There is a question that arises from this study which may help inform future blended MOOC designs. The authors insist that it is impossible to use a blended design with the "*original MOOC concept which has a large number of participants spread throughout the world*" (Gynther, 2016, p. 21) since blended sessions are inevitably local. This means that the courses involved in the blend should in fact be SPOCs or LOOCs. The courses blended by the authors in this study are described in rather vague terms as small MOOCs.

It is not clear what prevents a global MOOC from being used in a localised blended format, however. In fact, the literature on blended MOOCs appears to do that. It appears in these situations, that the MOOC designers and educators are themselves running the blended support (Bruff et al., 2013; Firmin et al., 2014b; Rayyan et al., 2016), but it is not clear what would prevent anyone to assemble a local cohort to run blended workshops around or in combination with global MOOC content. There may be resistance to incorporating content from MOOCs designed by others, but this is an issue that needs to be resolved, given the large upfront costs associated with MOOC production. The need to include many stakeholders within the co-design of MOOCs in order to achieve the embedding of the MOOC in blended designs is therefore paramount (Kennedy & Laurillard, 2019).Co-design of MOOCs for TPD in the context of mass displacement reported by (Kennedy, Abu Moghli, Chase, Pherali, & Laurillard, 2019) has involved engaging educators involved in traditional face-to-face teaching in various contexts from the beginning of the project, to introduce the concept and identify examples of excellent local practices that could be scaled up through a MOOC. This process continues to involve educators on the ground through both the design of the course and the construction of the materials (e.g. videoing teachers on location discussing their practice to provide authentic examples). This creates a situation where the MOOC is co-owned by a wide variety of educators who will happily blend it into their provision, creating a coherent and sustainable solution to TPD across a region.

In addition, Gynther's (2016) study also offers insights into the training of educators who support the blended workshops. The educators in their study were in many cases unfamiliar with the MOOC concept and were therefore likely to reproduce what had been taught online rather than support students in more meaningful ways. This challenge could also be addressed through involving these stakeholders in the MOOC co-design.

Moreover, the evaluation of the blended MOOC in Gynther's (2016) account showed that participants wanted to engage in a virtual community of practice that extended beyond their local networks, which would be eminently possible in a MOOC designed to maximise peer communication and knowledge sharing:

> *"Several students have identified an even greater potential for ongoing teacher professional development if the MOOCs were open to all teachers in a given subject within a given municipality or, alternatively, across municipalities" (p. 27)*

The opening of MOOCs – the original MOOC concept – is acknowledged by Gynther (2016, p. 28) therefore to lead to a MOOC becoming "*a professional community for ongoing teacher professional development in a municipality – and not just a training course*".

An example of blending an existing global TPD MOOC at a local level is provided by King, Luan, & Lopes (2018) who report on a study conducted on a very different scale. Here, a blended course for 7 Timorese teachers was created around an existing FutureLearn MOOC. The teachers both took part in a study group and studied independently. Teachers had unlimited access to the course content through a subsidised course upgrade, and the videos were also downloaded to facilitate watching offline by the group of teachers on a shared staff computer. The study

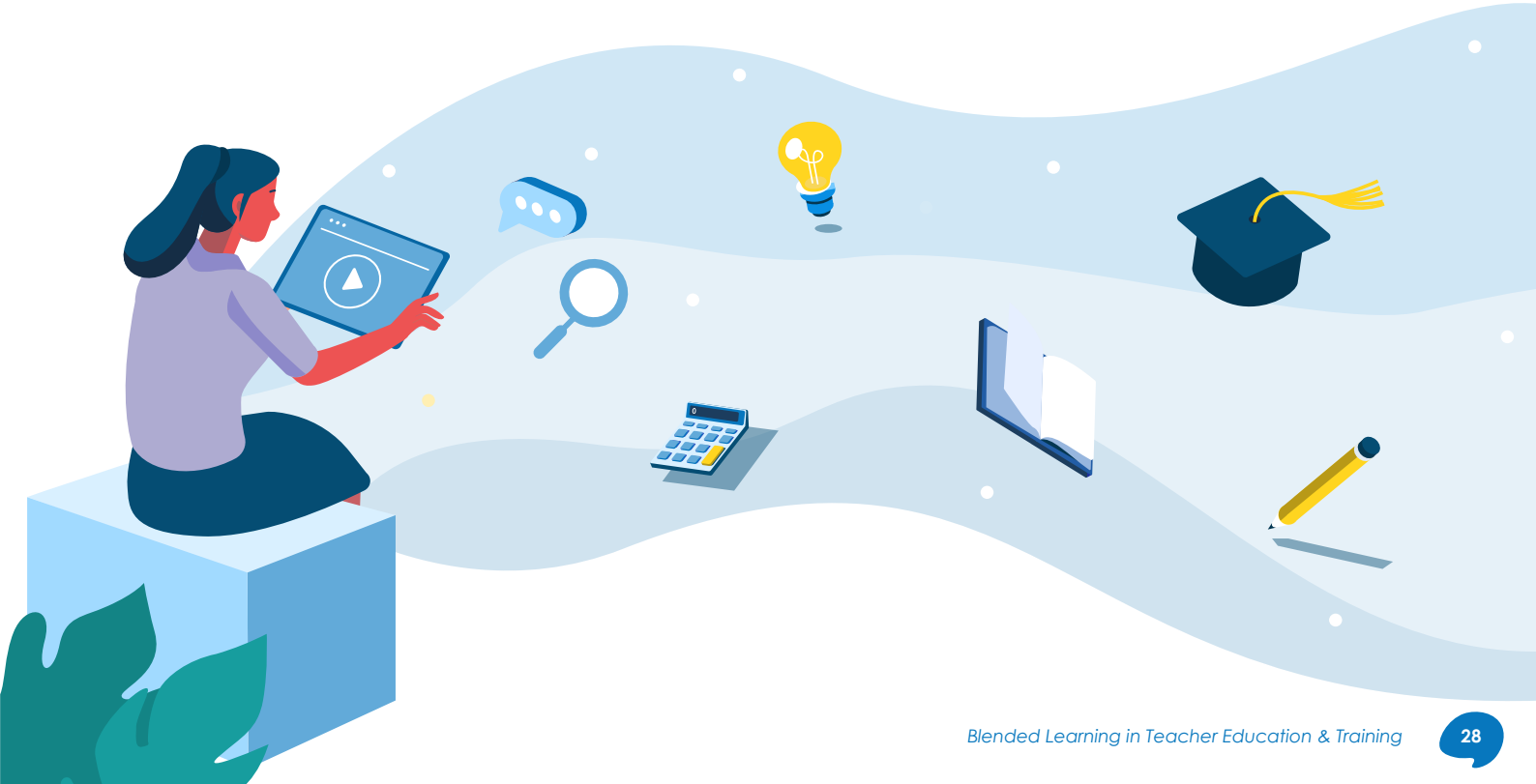
group met for 1-2 hours for each week the MOOC ran, watched the videos and discussed the content. Evaluative participatory research on the teachers' experience of the blend highlighted five benefits. The first was access to quality TPD resources provided by the MOOC that were highly appreciated by the Timorese teachers. A further benefit was in sharing with the teachers in the group and in the global online community. Teaches valued:

> *the opportunity to share reflections, opinions and insights from other group members, and other participants around the world. A number of teachers reported using the online comments pages as a resource to mine for teaching tips. (King et al., 2018, p. 281).*

In addition, the blended design provided support for collective reflections on practice. Two further benefits largely derived from the online part of the course – the motivation to try out new teaching ideas and improvements to English usage.

There were challenges to the design, however. The first of these was lack of access to sufficient internet bandwidth, which caused frustrations. The teachers used either laptops or mobile phones to access the courses, or a combination of the two. The authors report that some of the teachers found using mobile phones for learning to be "*counterintuitive, while others took to it readily*" (p. 283). The authors do not explore what aspects of the experience seemed counterintuitive but offering flexible ways of engaging in the course would appear necessary if participants are unwilling to use mobile phones and that is their only internet-enabled device. For example, using face-to-face sessions to catch up on online engagement. Other challenges included time management since the teachers had a busy schedule, a lack of familiarity or understanding of some aspects of the platform design, and distrust in how online engagement was monitored (e.g. the potential for gaining a certificate simply by marking a series of steps complete), as well as problems with payment for upgrades. Nevertheless, this example indicates that blends designed around existing MOOC content can provide high quality learning experiences for teachers.

A final example of a blended TPD MOOC is provided by Chase, Kennedy, Laurillard, Abu Moghli, & Pherali (2019). A blended learning course was designed around a co-designed multi-stakeholder collaborative MOOC to support teachers to become transformative educators in the context of mass displacement and other



challenging environments. The blended learning experience took place in Lebanon and involved teachers who were refugees, teaching at informal NGO schools, as well as teachers from the public and private school sectors. The blended design compensated for the variable infrastructure for online study in Lebanon and aimed to test its value for participants.

A series of three two-day, face-to-face workshops ran before, during and after the MOOC. Educators drawn from among the co-designers of the MOOC provided presentations and facilitated group discussions, and activities using digital tools featured in the MOOC. This supported the blended learning participants to engage with the platform, including to participate in the discussions, and to use the digital tools for collaborative activities in the course (e.g. Padlet, Mentimeter). The blended learning sessions also allowed for a deeper engagement with some of the more challenging content e.g. theory, controversial issues and learning design.

Results of the evaluation showed that the participating teachers valued the face-to-face discussion, and in particular, the opportunity to engage with the educators to clarify ideas, which improved their learning. The blended design created more space for discussion, to support teachers to try out ideas and digital tools and to clarify misconceptions or tackle software problems. In return, the teachers were better equipped to make fuller contributions to the MOOC, thus also benefiting the global learning community online. Despite the high costs of the blended learning course per participant in comparison to the online course, a blend is justified therefore, since the benefits can extend beyond the small group who benefit directly.

Summary

These research studies provide a number of insights that could aid implementation of blended MOOCs for TPD. The need to integrate MOOCs or other online courses into the face-to-face provision is fundamental. There are different ways of doing this, but for it to be truly considered as blended learning, this has to be a thoughtful combination, not separate activities happening online and face-to-face. Since providing face-to-face support inevitably incurs costs and limits the scale of access to those who are able to attend in person, the degree of integration will inevitably be a balance of costs vs. flexibility. The lighter integration, such as that presented by King et al., (2018) in Timor may be suitable when resources are limited. In this case, the face-to-face support compensated for the challenges to access in low internet bandwidth environments, and adding benefits of collective reflection and increased motivation to try out the ideas. If funding is available, a deeper engagement with content and the development of community is possible if the face-to-face classes are designed around a MOOC to augment learning as is described in the Lebanese example provided by Chase et al., (2019). In both of these cases, the MOOCs that are being used in a blended context are global, open MOOCs, showing that it is possible to blend massive scale courses, contrary to the view of (Gynther, 2016). This advantage of blending global MOOCs is two fold. Firstly, global MOOCs can provide teachers with access to a high quality learning experience and a global teaching community to share ideas, expanding the depth and breadth of their own practice. In addition, the blended approach also adds a local dimension, supporting teachers to find ways of putting ideas into practice in their own schools as described by King et al. (2018). By including both aspects, teachers are exposed other teachers' best ideas and are then enabled to adapt and adopt them in their specific contexts.

g. Summary and Recommendations from the Review of Existing Research

Blended learning has long been considered a viable option for TPD. The research presented here shows that this is for three reasons: the flexibility it offers, the cost efficiencies involved and the opportunities it provides for communication and community among teachers. However, it is this last reason that marks out the contribution of blended learning more than the others. Online learning also offers flexibility and cost savings, arguably more so than blended courses because of their requirement for attendance in person. However, the research has highlighted, and is focused upon improving, the sense of community created when working face-to-face with other teachers.

Despite this, the research also suggests that teachers value participating in a global online community too. It might be of concern, then, that there are research findings that suggest that teachers in blended learning programmes do not engage sufficiently in the online discussions. There are some lessons for improving this. A course requirement to post online, without overly prescribing what to post, has been shown to improve engagement (Nami et al., 2018), and to result in knowledge exchange and co-construction, which is a major goal of TPD. In addition, early blends that focused primarily on online collaboration rather than engagement with resources might also provide lessons for how to achieve this aim.

Nevertheless, the evolution of online learning, which has produced an array of high-quality open courses relevant to TPD, has in many ways enhanced the possibilities for providing blended TPD at low cost. The blending of MOOCs with face-to-face components has been tried and tested with university students with positive results. Research on blended TPD based on MOOCs is in its infancy, but there are models that show evidence of success. The important finding across all research on blending MOOCs is that the degree of integration of the MOOC with the face-to-face component is critical for success. Prior research on blended learning within TPD in general can also provide guidelines for implementation of blended learning TPD MOOCs.

To this end, this review has highlighted the design of blended learning implementations. Future research would benefit practitioners if the designs being evaluated could be made explicit. Practitioners themselves could also share clear representations of their own blended learning MOOC designs, along with evaluations of their effectiveness, in order to build up a database of evidence-informed Blended MOOC learnings designs that others could adapt and implement in their own context.

Finally, the research has focused on teachers' engagement with blended learning but has not so far extended into an evaluation of the impact of this on the outcomes of the students they teach. This is the critical next step to demonstrate the value of these cost-efficient, flexible and collaborative blended TPD programmes.

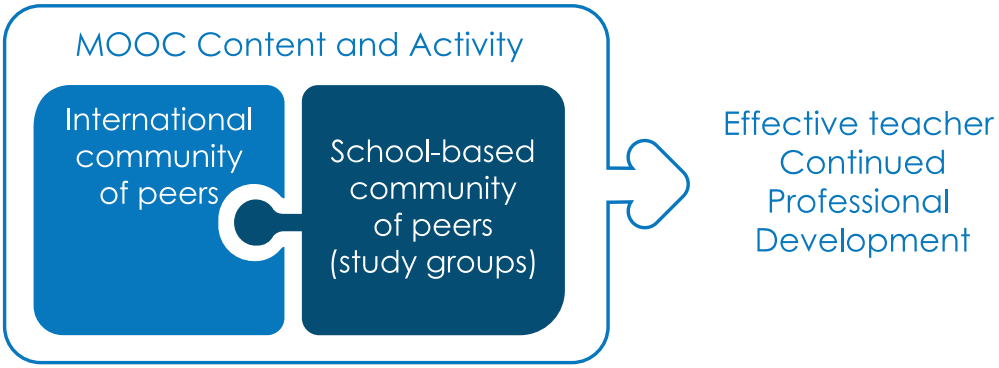
Recent Examples of Blended Learning in Teacher Education & Training in Europe

Three examples of blended learning in teacher education & training were presented at the Thematic Seminar which are briefly outlined in this section.

Italy – Using MOOCs in Schools

Elena Pezzi, language teacher at Liceo Laura Bassi in Bologna, reported about the use of MOOCs at school- and regional-level through a blended approach. Study groups were established at school-level as well as regional-level where teachers met once a week to take a MOOC together. The aim of these study groups was to benefit from the MOOCs' content and large international community of professionals who can inspire and support one another, while at the same time offering study group participants a professional development experience that is embedded in the daily reality of their school and supported by their immediate colleagues.

Figure 2: The aim of using school-based study groups alongside MOOCs



Accordingly, the study groups were designed so that teachers could come together to:

- Support and motivate one another throughout the MOOC
- Provide structure to their learning by offering a place and time to work on the MOOC
- Discuss the MOOC's topics and ideas in the context of the schools' realities
- Plan how to implement new ideas and practices after the MOOC

During the study group meetings, the teachers worked on the MOOC in small groups, discussed the activities, and supported each other with language or technical issues. At the end of the MOOC they presented their work to their colleagues and followed-up the work with peer observations of the lessons produced in the context of the MOOC and study group. The study groups were coordinated by a lead teacher who had previously taken the MOOCs and was available to support at all times.

The study groups elicited the following benefits at school-level:

- Allowed teachers with limited English language and digital competence to benefit from the MOOC offer. Most of these teachers would never have considered participating in a professional development online or in a non-native language.
- Brought together colleagues from different subjects and parts of the school who would otherwise very rarely collaborate or exchange with each other.
- Achieved a greater impact at school-level as most study group participants implemented innovative pedagogical approaches in their practice, validated by their immediate school peers.
- Highlighted the opportunities to teachers of working as part of an international community of teachers and utilising international professional development resources.

Due to the Covid-19 restrictions the study group concept was continued in 2020 but implemented in a purely online fashion with the study group meetings taking place online. While this required more organisation and benefited from the support of "*graduates*" of the previous study groups who acted as supporting coordinators and tutors to the new participants, it also proved highly successful. The work was conducted primarily via shared learning diaries, presentations and Padlets.

Denmark – "We want to learn something meaningful – in a meaningful way": Blended learning and teacher training within the vocational education sector

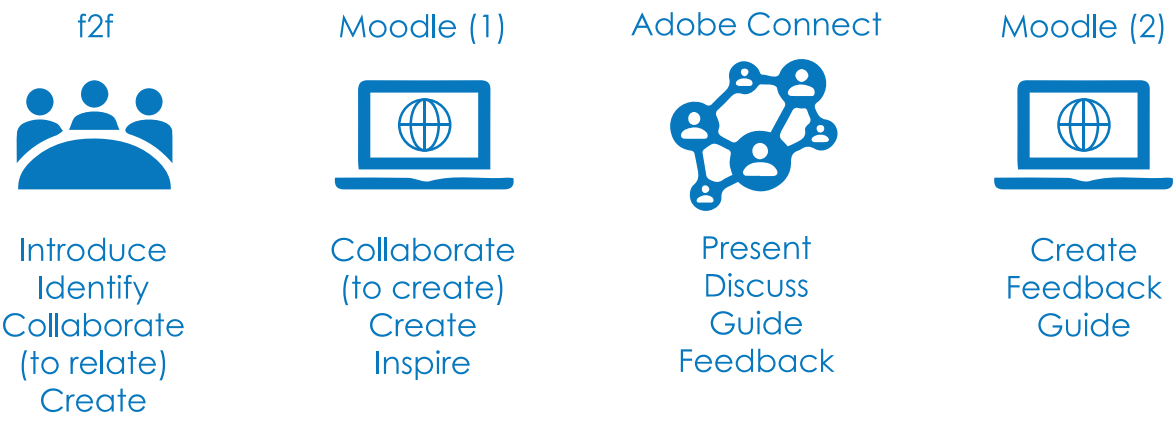
Søren Jørgensen, Pedagogical Consultant at the Danish National Knowledge Centre for eLearning, reported about the use of blended learning as part of a teacher training course for vocational education teachers on the topic of "*Education in Digital Learning*". The aim of using a blended learning approach in the teacher training on offer by the Knowledge Centre was to address two key challenges:

1. The bad reputation of traditional teacher training as being time consuming, far from everyday practice and having a low transfer effect to what was happening in the classroom.
2. The fact that the pedagogical consultants running the trainings are often not considered teachers' peers, with not sufficient insights into the challenges the participants face in their everyday work.

Through introducing a blended approach, the hope was to establish less distance between the learning and the implementation of what was learned.

When designing the course, the focus was on a meaningful integration between face-to-face and online learning. This integration was achieved through the following mix of face-to-face, asynchronous and synchronous online work with a purposeful pedagogic chronology of activities suited to the needs of the format used.

Figure 3: The pedagogical setup of the "Education in Digital Learning" course offered at the Danish National Knowledge Centre for eLearning.



This cycle of activities is repeated three times with the participants so that they become familiar and confident with the processes and dynamics used.

While the feedback from the participants is overall positive, the impact on the challenges the training set out to address is mixed. The organisation of such a course is not more efficient than a traditional face-to-face course and requires a substantial planning process and follow-up. It also does not fully address the danger of participants going "*back to normal*" once the course has come to an end – online activities happening when participants are back in school do not seem to be sufficient to achieve that. Rather, persistent and local follow-up activities seem to be necessary.

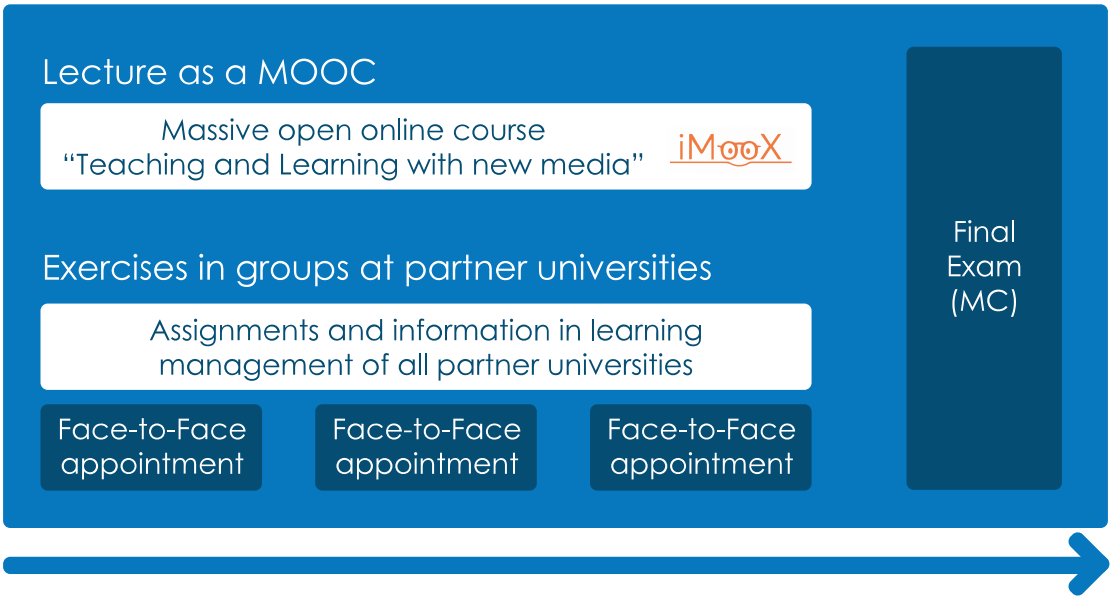
Austria – Teacher Training at Universities with "Inverse Blended MOOCs"

Sandra Schön, Senior Researcher at Graz University of Technology, reported about the collaboration of 6 universities in Austria offering initial teacher training to jointly develop a new teacher training module on "*Digital Competencies*". This module was developed as a blended module utilising a MOOC as the main content transmission tool in order to benefit from the partner universities respective expertise and achieve economies of scale.

An expert group was setup with members from the partner universities who developed the content of the module by producing a MOOC on the topic of "*Teaching and Learning with New Media*" that was offered on the iMOOX platform. The module was launched at the partner universities in parallel to the MOOC in 2019. Instead of offering lectures as part of the module, the content transmission part of the module happened via the MOOC. This was coupled with a mix of face-to-face meetings at each university as well as assignments and more custom information in the learning management system of each university. The same final exam was offered at all partner universities, available to student teachers at the universities as well as external participants of the MOOC.

As part of the face-to-face sessions, student teachers worked in groups on a course product in the form of a learning video. In order to receive the full credits for the module, student teachers had to submit their learning video and pass the final exam.

Figure 4: The setup of the teacher training module "Digital Competencies"



The results are overall positive with a completion rate of 49% of those registered to the MOOC receiving a certificate and 41% of registered MOOC participants completing the full module (MOOC, group work, learning video, final exam). The module was continued with a slightly adapted setup in 2020 by moving the university-based activities online but retaining the small-scale and synchronous nature of the meetings.

Conclusion

The findings and experiences outlined in this report highlight the potential of blended learning in teacher education & training and the conditions necessary to achieve the benefits offered by a blended approach. As an increasing number of teacher educators shift to online and blended learning formats, it is essential that careful consideration is given to the meaningful integration of the online and onsite elements of the learning process. Teacher educators can use the research findings and experiences in this report to achieve such meaningful integration.

In particular in regard to MOOCs, the provision of an onsite learning framework that sits alongside a MOOC, offers significant opportunities to address some of the main challenges of MOOC participation while still retaining many benefits of an international and centralised course production process as well as an international course community of teachers. The European Schoolnet Academy aims to build on this by exploring how to better support teachers, school leaders, and teacher training organisations to setup school-based or local infrastructures that allow teachers to take MOOCs collaboratively and within their local contexts.

For further information about this report or the European Schoolnet Academy Thematic Seminar series please contact: benjamin.hertz@eun.org

Glossary

A la carte model: a blended learning design that offers the opportunity to take an online course in addition to other face-to-face courses.

Blended Learning: a combination of face-to-face experiences, in which learners are co-located, with online experiences, where learners are not at the same location.

Blended MOOCs: Massive Open Online Courses are free online courses available for anyone to enroll. Accordingly, they are designed for scalability and can accommodate large numbers of participants.

Community of Inquiry (CoI) model: a process of creating a deep and meaningful (collaborative-constructivist) learning experience through the development of three interdependent elements – social, cognitive and teaching presence.

Connectivism: a learning theory which posits that in a digital age where knowledge is stored and readily available, learning is less about the acquisition of knowledge and more about the process of creating connections to people and content and being able to use and navigate these connections to access the right knowledge when needed.

Constructivism: a learning theory which posits that learners actively attempt to create meaning from experience.

Enriched virtual model: a blended learning design that offers a primarily online experience, with students attending face-to-face classes for support.

European Schoolnet Academy: European platform offering MOOCs for school teachers and other school practitioners. It is run by European Schoolnet, the network of 34 European Ministries of Education, based in Brussels.

Flex model: a blended learning design using a primarily online learning experience supported by a teacher available in class.

Flipped classroom: a blended learning design where students are responsible for consuming the learning material outside of class, and then the instructor uses classroom time to guide students through activities, help them get back on track, answer questions, etc.

Hybrid learning: various meanings referring to a combination of learning approaches - more recently it refers to a learning experience where the educator simultaneously engages with a mixture of students attending on-campus and digitally.

Individual rotation: a blended learning design where the teacher sets individual timings for the students for rotation among different learning modalities. It differs from other rotation models as the students don't have to rotate to each available station.

Inverse blended learning: an approach that enhances a pure online course with additional offline meetings for exchange and practising.

Lab rotation: a blended learning design which is the same as the station rotation design but the online learning occurs in a dedicated computer lab.

LOOC: Little Open Online Courses.

Quasi-experimental: a research study that uses an experimental design but lacks the random assignation into a test and control group.

Rotation models: a blended learning design that shifts the learning between face-to-face and online according to a fixed schedule. It exists in different variations.

Self-regulated learning: is a cyclical process by which when faced with a learning goal, students are actively planning, monitoring and adapting (performing), and reflecting on their learning strategies in order to succeed. This involves the establishment of goals and then selecting the right strategies by which to reach them. In doing so, students self-regulate their metacognition (thinking about one's thinking), behaviour (planning, monitoring, and evaluating), and motivation to accomplish the task at hand.

SPOCs: Small Private Online Courses.

Station rotation: a blended learning design where students rotate through stations on a fixed schedule, where at least one of the stations is via online learning.

Technological, Pedagogical and Content Knowledge (TPACK) framework: a framework to understand and describe the kinds of knowledge needed by a teacher for effective pedagogical practice in a technology-enhanced learning environment.

Wrapper approach: when a face-to-face course is wrapped around an existing external MOOC.

References

Allen, I. E., Seaman, J., & Garrett, R. (2007). Blending in: The extent and promise of blended education in the United States. *The Sloan Consortium*. https://doi.org/10.1007/s00170-005-0274-8

Alonso, F., López, G., Manrique, D., & Viñes, J. M. (2005). An instructional model for web-based e-learning education with a blended learning process approach. *British Journal of Educational Technology*. https://doi.org/10.1111/j.1467-8535.2005.00454.x

Anderson, R. K., Boaler, J., & Dieckmann, J. A. (2018). Achieving elusive teacher change through challenging myths about learning: A blended approach. *Education Sciences*, *8*(3). https://doi.org/10.3390/educsci8030098

Anshari, M. (2015). Constructing Strategy of Online Learning in Higher Education: Transaction Cost Economy, (September).

Ashton, J., & Elliott, R. (2007). Juggling the balls—study, work, family and play: student perspectives on flexible and blended heutagogy. *European Early Childhood Education Research Journal*, *15*(2), 167–181. https://doi.org/10.1080/13502930701321378

Bates, T. (2000). *Financial Strategies and Resources to Support Online Learning*. Vancouver. Retrieved from https://www.researchgate.net/publication/228759263_Financial_strategies_and_resources_to_support_online_learning

Bates, T. (2001). *National strategies for e-learning in post-secondary education and training*. Paris. Retrieved from http://www.unesco.org/iiep

Bayeck, R. Y. (2016). Exploratory study of MOOC learners' demographics and motivation: The case of students involved in groups. *Open Praxis*, *8*(3), 223–233. https://doi.org/10.5944/openpraxis.8.3.282

Biasutti, M., Frate, S., & Concina, E. (2019). Music teachers' professional development: assessing a three-year collaborative online course. *Music Education Research*, *21*(1), 116–133. https://doi.org/10.1080/14613808.2018.1534818

Boitshwarelo, B. (2009). Exploring blended learning for science teacher professional development in an african context. *International Review of Research in Open and Distance Learning*, *10*(4). https://doi.org/10.19173/irrodl.v10i4.687

Brahimi, T., & Sarirete, A. (2015). Learning outside the classroom through MOOCs. *Computers in Human Behavior*, *51*, 604–609. https://doi.org/10.1016/j.chb.2015.03.013

Bruff, D. O., Fisher, D. H., McEwen, K. E., & Smith, B. E. (2013). Wrapping a MOOC: Student Perceptions of an Experiment in Blended Learning. *MERLOT Journal of Online Learning and Teaching*, *9*(2), 187–199.

Brysch, C. P. (2020). Teacher Attitudes toward Alternative Professional Development in Geography. *Journal of Geography*, *119*(2), 55–62. https://doi.org/10.1080/00221341.2019.1706621

Burns, M. (2011). *Distance Education for Teacher Training: Modes, Models, and Methods*.

Castaño-Muñoz, J., Kalz, M., Kreijns, K., & Punie, Y. (2018). Who is taking MOOCs for teachers' professional development on the use of ICT? A cross-sectional study from Spain. *Technology, Pedagogy and Education*, *27*(5), 607–624. https://doi.org/10.1080/1475939X.2018.1528997

Chase, E., Kennedy, E., Laurillard, D., Abu Moghli, M., & Pherali, T. (2019). A Co-Design Methodology for Blended Teacher Professional Development in Contexts of Mass Displacement. In *Teachers*

in crisis contexts: Promising practices in teacher well-being, teacher management, and teacher professional development (pp. 63–66). INEE.

Chingos, M. M., Griffiths, R. J., Mulhern, C., & Spies, R. R. (2017). Interactive Online Learning on Campus: Comparing Students' Outcomes in Hybrid and Traditional Courses in the University System of Maryland. *The Journal of Higher Education*, *88*(2), 210–233. https://doi.org/10.1080/00221546.2016.1244409

Clary, R. M., Dunne, James, A., Elder, Anastasia, D., Saebo, S., Beard, D. J., Wax, C. L., … Tucker, D. L. (2017). Optimizing Online Content Instruction for Effective Hybrid Teacher Professional Development Programs. *Journal of Science Teacher Education*, *28*(6), 507–521. https://doi.org/10.1080/1046560X.2017.1379859

Clary, R. M., Dunne, J. A., Elder, A. D., Saebo, S., Beard, D. J., Wax, C. L., … Tucker, D. L. (2017). Optimizing online content instruction for effective hybrid teacher professional development programs. *Journal of Science Teacher Education*. https://doi.org/10.1080/1046560X.2017.1379859

Clayton Christensen Institute. (n.d.). Blended Learning Models. Retrieved November 7, 2020, from https://www.blendedlearning.org/models/?__cf_chl_jschl_tk__=be6d836fb5530d87f2d9b4cf6acfb3574c602d1c-1604747052-0-AU7u8gfqHqgTy5IhWhfqCiWdoExj37ig9-rNIVSE2GmK0z5arplMmDDQX8vSfwQbLv5RmRklDjWkZuwN-Cp4oUWUfogWZUGq00syqHNQha-LHKoUw31iGRPobIe5JUUOMGhAx_YtEPzAI

Courseara. (2016). Coming soon to all courses: Flexible session-based schedules. Retrieved October 27, 2020, from https://blog.coursera.org/coming-soon-to-all-courses-flexible-session-based/

Dale, V. H. M., & Singer, J. (2019). Learner experiences of a blended course incorporating a MOOC on Haskell functional programming. *Research in Learning Technology*, *27*(0), 1–15. https://doi.org/10.25304/rlt.v27.2248

Delgado Kloos, C., Muñoz-Merino, P. J., Alario-Hoyos, C., Estévez Ayres, I., & Fernández-Panadero, C. (2015). Mixing and blending MOOC Technologies with face-to-face pedagogies. In *IEEE Global Engineering Education Conference, EDUCON* (Vol. 2015-April). https://doi.org/10.1109/EDUCON.2015.7096090

Doğan, D., & Gülbahar, Y. (2018). Using facebook as social learning environment. *Informatics in Education*, *17*(2), 207–228. https://doi.org/10.15388/infedu.2018.11

EdX. (2020). How do self-paced courses work? – edX Help Center. Retrieved October 27, 2020, from https://support.edx.org/hc/en-us/articles/206503568-How-do-self-paced-courses-work-

Evans, J. C., Yip, H., Chan, K., Armatas, C., & Tse, A. (2020). Blended learning in higher education: professional development in a Hong Kong university. *Higher Education Research and Development*, *39*(4), 643–656. https://doi.org/10.1080/07294360.2019.1685943

Firmin, R., Schiorring, E., Whitmer, J., Willett, T., Collins, E. D., & Sujitparapitaya, S. (2014a). Case study: using MOOCs for conventional college coursework. *Distance Education*, *35*(2), 178–201. https://doi.org/10.1080/01587919.2014.917707

Firmin, R., Schiorring, E., Whitmer, J., Willett, T., Collins, E. D., & Sujitparapitaya, S. (2014b). Case study: using MOOCs for conventional college coursework. https://doi.org/10.1080/01587919.2014.917707

Freitas, A., & Paredes, J. (2018). Understanding the faculty perspectives influencing their innovative practices in MOOCs/SPOCs: a case study. *International Journal of Educational Technology in Higher Education*, *15*(1). https://doi.org/10.1186/s41239-017-0086-6

Fresen, J. W., & Hendrikz, J. (2009). Designing to promote access, quality, and student support in an advanced certificate programme for rural teachers in south africa. *International Review of Research in Open and Distance Learning*, *10*(4). https://doi.org/10.19173/irrodl.v10i4.631

FutureLearn. (2020). How long can I access a course for free? – FutureLearn. Retrieved October 27, 2020,

from https://futurelearn.zendesk.com/hc/en-us/articles/115010582788-How-long-can-I-access-a-course-for-free-

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *Internet and Higher Education*, *7*(2), 95–105. https://doi.org/10.1016/j.iheduc.2004.02.001

Goos, M., O'Donoghue, J., Ní Ríordáin, M., Faulkner, F., Hall, T., & O'Meara, N. (2020). Designing a national blended learning program for "*out-of-field*" mathematics teacher professional development. *ZDM – Mathematics Education*, *52*(5), 893–905. https://doi.org/10.1007/s11858-020-01136-y

Graziano, K. J. (2017). Peer Teaching in a Flipped Teacher Education Classroom. *TechTrends*, *61*(2), 121–129. https://doi.org/10.1007/s11528-016-0077-9

Gynther, K. (2016a). Design framework for an adaptive MOOC enhanced by blended learning: Supplementary training and personalized learning for teacher professional development. *Electronic Journal of E-Learning*, *14*(1), 15–30. Retrieved from https://search-proquest-com.libproxy.ucl.ac.uk/docview/1792596560?rfr_id=info%3Axri%2Fsid%3Aprimo

Gynther, K. (2016b). Design framework for an adaptive MOOC enhanced by blended learning: Supplementary training and personalized learning for teacher professional development. *Electronic Journal of E-Learning*, *14*(1).

Haggard, S., & BIS. (2013). *The Maturing of the MOOC*. *BIS Research paper 130*. London. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/240193/13-1173-maturing-of-the-mooc.pdf

Herrington, J., Oliver, R., & Reeves, T. C. (2003). Patterns of engagement in authentic online learning environments. *Australasian Journal of Educational Technology*. https://doi.org/10.14742/ajet.1701

Ho, V. T., Nakamori, Y., Ho, T. B., & Lim, C. P. (2016). Blended learning model on hands-on approach for in-service secondary school teachers: Combination of E-learning and face-to-face discussion. *Education and Information Technologies*, *21*(1), 185–208. https://doi.org/10.1007/s10639-014-9315-y

Hoffmann-Dumienski, K. (2016). Professional development across the islands of the South Pacific: A perspective of a blended learning facilitator. *Journal of Open, Flexible and Distance Learning*, *20*(2), 66–78.

Hollands, F. M., & Tirthali, D. (2014). MOOCs : Expectations and Reality, (May).

Holmes, A., Polhemus, L., & Jennings, S. (2005). CATIE: A blended approach to situated professional development. *Journal of Educational Computing Research*. https://doi.org/10.2190/F97W-QUJ4-G7YG-FPXC

Holotescu, C., & Carmen Holotescu, Gabriela Grosseck, Vladimir Cre□u, A. N. (2014). Integrating Moocs in Blended Courses. In *The 10th International Scientific Conference eLearning and software for Education*. Bucharest.

Hramiak, A. (2010). Online learning community development with teachers as a means of enhancing initial teacher training. *Technology, Pedagogy and Education*, *19*(1), 47–62. https://doi.org/10.1080/14759390903579265

Israel, M. J. (2015). Effectiveness of integrating MOOCs in traditional classrooms for undergraduate students. *International Review of Research in Open and Distance Learning*, *16*(5), 102–118. https://doi.org/10.19173/irrodl.v16i5.2222

Kennedy, E., Abu Moghli, M., Chase, E., Pherali, T., & Laurillard, D. (2019). A Co-Design Methodology for Blended Teacher Professional Development in Contexts of Mass Displacement. *NORRAG*, (02). Retrieved from https://www.norrag.org/nsi-02-data-collection-and-evidence-building-to-support-education-in-emergencies/

Kennedy, E., & Laurillard, D. (2019). The potential of MOOCs for large-scale teacher professional

development in contexts of mass displacement. *London Review of Education*, *17*(2), 141–158. https://doi.org/10.18546/LRE.17.2.04

Kennedy, E., Laurillard, D., Horan, B., & Charlton, P. (2015). Making meaningful decisions about time, workload and pedagogy in the digital age: the Course Resource Appraisal Model. *Distance Education*, *7919*(January), 1–19. https://doi.org/10.1080/01587919.2015.1055920

Kimmelmann, N., & Lang, J. (2019). Linkage within teacher education: cooperative learning of teachers and student teachers. *European Journal of Teacher Education*, *42*(1), 52–64. https://doi.org/10.1080/02619768.2018.1547376

King, M., Luan, B., & Lopes, E. (2018). Experiences of Timorese language teachers in a blended Massive Open Online Course (MOOC) for Continuing Professional Development (CPD). *Open Praxis*, *10*(3), 279. https://doi.org/10.5944/openpraxis.10.3.840

Kitchenham, A., & Chasteauneuf, C. (2010). Teacher supply and demand: Issues in Northern Canada. *Canadian Journal of Education*, *33*(4), 869–896.

Kizilcec, R. F., & Halawa, S. (2015). Attrition and Achievement Gaps in Online Learning. In *Proceedings of the Second (2015) ACM Conference on Learning @ Scale – L@S '15* (pp. 57–66). New York, New York, USA: ACM Press. https://doi.org/10.1145/2724660.2724680

Kizilcec, R. F., & Piech, C. (2013). *Deconstructing Disengagement : Analyzing Learner Subpopulations in Massive Open Online Courses Categories and Subject Descriptors*. Stanford. Retrieved from http://lytics.stanford.edu/deconstructing-disengagement/

Krasnova, L., & Shurygin, V. (2019). Blended learning of physics in the context of the professional development of teachers. *International Journal of Emerging Technologies in Learning*, *14*(23), 17–32. https://doi.org/10.3991/ijet.v14i23.11084

Kupetz, R., & Ziegenmeyer, B. (2006). Flexible learning activities fostering autonomy in teaching training. *ReCALL*, *18*(1), 63–82. https://doi.org/10.1017/S0958344006000516

Kurt, G. (2017). Implementing the flipped classroom in teacher education: Evidence from Turkey. *Educational Technology and Society*, *20*(1), 211–221.

Laura Pappano. (2012, November 2). The Year of the MOOC. *New York Times*. Retrieved from https://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html?pagewanted=all

Laurillard, D. (2011). *Policy Brief: Cost-Benefit Modelling for Open Learning*. Moscow. Retrieved from iite.unesco.org

Laurillard, D. (2014). *Thinking about blended learning: A paper for the Thinkers in Residence programme*. Brussels.

Laurillard, D. (2016). The educational problem that MOOCs could solve: Professional development for teachers of disadvantaged students. *Research in Learning Technology*, *24*(1063519), 1–17. https://doi.org/10.3402/rlt.v24.29369

Laurillard, D., & Kennedy, E. (2017). *The potential of MOOCs for learning at scale in the Global South* (Centre for Global Higher Education working paper series No. 31). Retrieved from http://www.researchcghe.org/perch/resources/publications/wp31.pdf

Laurillard, D., & Kennedy, E. (2020). MOOCs and Professional Development: The Global Potential of Online Collaboration. In C. Callender, S. Marginson, & W. Locke (Eds.), *Changing Higher Education for a Changing World* (pp. 157–170). London: Bloomsbury Academic. https://doi.org/10.5040/9781350108448.0020

Li, N., Verma, H., Skevi, A., Zufferey, G., Blom, J., & Dillenbourg, P. (2014). Watching MOOCs together: investigating co-located MOOC study groups. *Distance Education*, *35*(2). https://doi.org/10.1080/01587919.2014.917708

Lieberman, M. (2019). New approaches to discussion boards aim for dynamic online learning experiences. Retrieved November 13, 2020, from https://www.insidehighered.com/digital-learning/article/2019/03/27/new-approaches-discussion-boards-aim-dynamic-online-learning

Marrinan, H., Firth, S., Hipgrave, D., & Jimenez-Soto, E. (2015). Let's take it to the clouds: The potential of educational innovations, including blended learning, for capacity building in developing countries. *International Journal of Health Policy and Management*, *4*(9), 571–573. https://doi.org/10.15171/ijhpm.2015.121

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). Evaluation of Evidence-Based Practices in Online Learning. *Structure*.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2012). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. In *Learning Unbound: Select Research and Analyses of Distance Education and Online Learning* (pp. 41–133). Retrieved from www.ed.gov/about/offices/list/opepd/ppss/reports.html.

Meyer, K. (2014). An Analysis of the Cost and Cost-Effectiveness of Faculty Development for Online Teaching. *Journal of Asynchronous Learning Networks*, *17*(4), 93–113.

MIRONOV, C., BORZEA, A., & CIOLAN, L. (2014). BLENDED-LEARNING – AN EFFECTIVE TOOL FOR THE PROFESSIONAL DEVELOPMENT OF HIGHER EDUCATION TEACHERS. In *The 8 th International Scientific Conference eLearning and software for Education INTEGRATING MOOCs IN BLENDED COURSES* (pp. 226–231). Bucharest.

Moriña, A. (2019). Learning from experience: training for faculty members on disability. *Perspectives: Policy and Practice in Higher Education*, *23*(2–3), 86–92. https://doi.org/10.1080/13603108.2018.1534759

Nami, F., Marandi, S. S., & Sotoudehnama, E. (2018). Interaction in a discussion list: An exploration of cognitive, social, and teaching presence in teachers' online collaborations. *ReCALL*, *30*(3), 375–398. https://doi.org/10.1017/S0958344017000349

Onguko, B., Jepchumba, L., & Gaceri, P. (2013). "*For us it was a learning experience*": Design, development and implementation of blended learning. *European Journal of Training and Development*, *37*(7), 615–634. https://doi.org/10.1108/EJTD-10-2012-0052

Owston, R., Wideman, H., Murphy, J., & Lupshenyuk, D. (2008). Blended teacher professional development: A synthesis of three program evaluations. *Internet and Higher Education*, *11*(3–4), 201–210. https://doi.org/10.1016/j.iheduc.2008.07.003

Papanikolaou, K., Makri, K., & Roussos, P. (2017). Learning design as a vehicle for developing TPACK in blended teacher training on technology enhanced learning. *International Journal of Educational Technology in Higher Education*, *14*(1). https://doi.org/10.1186/s41239-017-0072-z

Paskevicius, M., & Bortolin, K. (2016). Blending our practice: using online and face-to-face methods to sustain community among faculty in an extended length professional development program. *Innovations in Education and Teaching International*, *53*(6), 605–615. https://doi.org/10.1080/14703297.2015.1095646

Pérez-Sanagustín, M., Hilliger, I., Alario-Hoyos, C., Kloos, C. D., & Rayyan, S. (2017a). H-MOOC framework: reusing MOOCs for hybrid education. *Journal of Computing in Higher Education*, *29*(1), 47–64. https://doi.org/10.1007/s12528-017-9133-5

Pérez-Sanagustín, M., Hilliger, I., Alario-Hoyos, C., Kloos, C. D., & Rayyan, S. (2017b). H-MOOC framework: reusing MOOCs for hybrid education. *Journal of Computing in Higher Education*. https://doi.org/10.1007/s12528-017-9133-5

Pérez-Sanagustín, M., Hilliger, I., Schwarzenberg, P., & Parra, D. (2015). A framework of hybrid MOOC-based pedagogies. In *CEUR Workshop Proceedings*.

Philipsen, B., Tondeur, J., Pareja Roblin, N., Vanslambrouck, S., & Zhu, C. (2019). Improving teacher professional development for online and blended learning: a systematic meta-aggregative review. *Educational Technology Research and Development*, *67*(5), 1145–1174. https://doi.org/10.1007/s11423-019-09645-8

Qasem, A. A. A., & Viswanathappa, G. (2016). Teacher perceptions towards ICT integration: Professional development through blended learning. *Journal of Information Technology Education: Research*, *15*, 561–575. https://doi.org/10.28945/3562

Rayyan, S., Fredericks, C., Colvin, K. F., Liu, A., Teodorescu, R., Barrantes, A., … Pritchard, D. E. (2016). A MOOC based on blended pedagogy. *Journal of Computer Assisted Learning*, *32*(3). https://doi.org/10.1111/jcal.12126

Robertson, I. (2008). Learners' attitudes to wiki technology in problem based, blended learning for vocational teacher education. *Australasian Journal of Educational Technology*, *24*(4), 425–441. https://doi.org/10.14742/ajet.1202

Seraphin, K. D., Philippoff, J., Parisky, A., Degnan, K., & Warren, D. P. (2013). Teaching Energy Science as Inquiry: Reflections on Professional Development as a Tool to Build Inquiry Teaching Skills for Middle and High School Teachers. *Journal of Science Education and Technology*, *22*(3), 235–251. https://doi.org/10.1007/s10956-012-9389-5

Smith, K., & Hill, J. (2019). Defining the nature of blended learning through its depiction in current research. *Higher Education Research and Development*, *38*(2), 383–397. https://doi.org/10.1080/07294360.2018.1517732

Swinnerton, B. J., Morris, N. P., Hotchkiss, S., & Pickering, J. D. (2017). The integration of an anatomy massive open online course (MOOC) into a medical anatomy curriculum. *Anatomical Sciences Education*, *10*(1). https://doi.org/10.1002/ase.1625

TAMI, S. (2016). Patterns of Mobile Technology Use in Teaching: The Teacher Perspective. *I-Manager's Journal of Educational Technology*, *13*(3), 1. https://doi.org/10.26634/jet.13.3.8316

Toci, V. (2016). Innovations in the continuing professional development of foreign language teachers: from blended learning to visual-based learning, choices of emotional and instructional designs. *Research on Education and Media*, *8*(1), 44–52. https://doi.org/10.1515/rem-2016-0006

Trust, T., & Horrocks, B. (2017). 'I never feel alone in my classroom': teacher professional growth within a blended community of practice. *Professional Development in Education*, *43*(4), 645–665. https://doi.org/10.1080/19415257.2016.1233507

Turan, Z., & Göktaş, Y. (2018). Innovative Redesign of Teacher Education ICT Courses: How Flipped Classrooms Impact Motivation? *Journal of Education and Future*, (13), 133–144. Retrieved from https://search.proquest.com/docview/2122479536?accountid=13042%0Ahttp://oxfordsfx.hosted.exlibrisgroup.com/oxford?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/t:kev:mtx:journal&genre=article&sid=ProQ:ProQ%3Aeducation&atitle=Innovative+Redesign+of+Teacher+Ed

Twigg, C. A. (2003). Improving Learning and Reducing Costs: New Models for Online Learning. *Educause Review*, *38*(October), 28–38.

University of Edinburgh. (2020). Adapting to hybrid teaching | The University of Edinburgh. Retrieved November 13, 2020, from https://www.ed.ac.uk/covid-19-response/our-community/adapting-to-hybrid-teaching

Van Wyk, M. M. (2019). Flipping the Economics Class in a Teacher Education Course. *Technology, Knowledge and Learning*, *24*(3), 373–399. https://doi.org/10.1007/s10758-018-9377-9

Voogt, J., Almekinders, M., Van Den Akker, J., & Moonen, B. (2005). A "*blended*" in-service arrangement for classroom technology integration: Impacts on teachers and students. *Computers in Human Behavior*. https://doi.org/10.1016/j.chb.2004.10.003

Vrasidas, C., & Hadjisofoclis, D. (2015). *Cost-Effectiveness of Digital Learning for Development: Towards a Systematic, Systemic, and Sustainable Framework*.

Yılmaz, Ö., & Malone, K. L. (2020). Preservice teachers perceptions about the use of blended learning in a science education methods course. *Smart Learning Environments*, *7*(1). https://doi.org/10.1186/s40561-020-00126-7

Yousef, A. M. F., Chatti, M. A., Schroeder, U., & Wosnitza, M. (2014). What drives a successful MOOC? An empirical examination of criteria to assure design quality of MOOCs. In *Proceedings – IEEE 14th International Conference on Advanced Learning Technologies, ICALT 2014*. https://doi.org/10.1109/ICALT.2014.23

Yu, C. (2015). Challenges and Changes of MOOC to Traditional Classroom Teaching Mode. *Canadian Social Science*, *11*(111), 135–139. https://doi.org/10.3968/6023

Yurkofsky, M. M., Blum-Smith, S., & Brennan, K. (2019). Expanding outcomes: Exploring varied conceptions of teacher learning in an online professional development experience. *Teaching and Teacher Education*, *82*, 1–13. https://doi.org/10.1016/j.tate.2019.03.002

www.eunacademy.org