



Preparing Teachers for Effective K-12 Online Learning in the Age of Disruptions: A Call for Transforming Teacher Education

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RESEARCH ARTICLE

ABSTRACT

In light of current or future pandemics, natural disasters, war, or personal preferences, remote or online learning is becoming increasingly common. This reality means that teachers need to be equipped with the skills necessary to effectively teach online. In this article the authors highlight the importance of preparing teachers with effective online teaching skills and knowledge, and suggest two areas for improvement: (1) research support for scholars to build a knowledge base to better understand effective online teaching, and (2) changes to teacher preparation programmes to better equip teachers for this changing reality. Before presenting these recommendations, a brief discussion of the state of online learning globally at the primary and secondary level (commonly referred to as K-12), as well as the limitations of existing teacher education, prior to the COVID-19 pandemic is provided.

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KEYWORDS:

K-12 online learning; online learning; teacher preparation; emergency remote teaching; professional development; digital pedagogy; emergency preparedness; remote instruction; teacher education; teacher preparation

TO CITE THIS ARTICLE:

Barbour, M. K., & Hodges, C. B. (2024). Preparing Teachers for Effective K-12 Online Learning in the Age of Disruptions: A Call for Transforming Teacher Education. *Open Praxis*, 16(4), pp. 583–594. DOI: <https://doi.org/10.55982/openpraxis.16.4.727>

As noted in the International Commission on the Futures of Education's (2021) *Reimagining our Futures Together: A New Social Contract for Education*, "in the era of COVID-19 we have seen that digital technologies are essential for public health and public education: an indispensable tool for distance education, for contact and vaccine tracing, for reliable information about the virus and more" (p. 37). Both the reality of this sentiment and the urgency in which it needs to occur has been underscored by other international agencies, such as the *European Commission's European Framework for the Digital Competence of Educators* or DigCompEdu (Punie & Redecker, 2017) and UNESCO (2023) through the digital competencies in their *ICT Competency Framework for Teachers* (i.e., ICT = information communications and technology). Globally, teachers need to be prepared to teach online because of the need for students to engage in remote or online learning with increasing frequency due to factors such as the COVID-19 pandemic, natural disasters, war, or personal preference – among other reasons.

However, as Horváth et al. (2022) concluded in their review of teaching and learning in schools in Europe during the COVID-19 pandemic, "many schools were ill-prepared for this unprecedented situation" (p. 3). In this article, we outline the necessity of equipping teachers with the skills to effectively teach in an online environment and provide recommendations for improved teacher preparation for online learning, which consist of two general areas: (1) research directions and supports for scholars, and (2) changes to teacher preparation programs. These recommendations rely on the needed digital infrastructure to support online learning, but a discussion of that infrastructure is beyond the scope of the present paper. Before providing the goals and recommendations, we begin with a discussion of the state of K-12 online learning globally prior to the pandemic.

STATE OF K-12 ONLINE LEARNING PRIOR TO 2020

Prior to the pandemic, K-12 (i.e., primary and secondary level) distance and online learning had a long history in certain jurisdictions. For example, correspondence education has been used in the K-12 environment in places like Australia, Canada, New Zealand, and the United States for over a century (Barbour, 2014; Clark, 2003; Rumble, 1989; Stevens, 1994). Educational radio has been used since the 1940s (Moore & Kearsley, 1996; Stacey & Visser, 2005), and telematics-supported learning has been implemented since the 1980s (Brown et al., 2000; Oliver & Reeves, 1994). Throughout the 1990s and early 2000s, nations on just about every continent began to experiment with K-12 online learning (Barbour, 2018), but the level of K-12 online learning activity varied from nation to nation. There were a small number of jurisdictions, such as South Korea (Cho, 2009; Jang, 2006), where K-12 online learning was prevalent. However, even in countries where K-12 online learning was common, it often only touched 5% to 10% of the overall K-12 student population (Barbour & LaBonte, 2023; Digital Learning Collaborative, 2024). Unfortunately, the examples cited above do not include any examples from Europe, where there has been much less of a focus on virtual schooling (Bergdahl & Hietajärvi, 2022; Jakobsdóttir & Jóhannsdóttir, 2018). Finally, in most cases K-12 online learning only accounted for a very small portion of the overall K-12 education system (Bacsich et al., 2012a, 2012b; Barbour et al., 2011).

While distance education may have a long history in the K-12 system, the use of K-12 online learning was still quite uncommon in most jurisdictions prior to the pandemic. Even in locations where it was more common, few teachers had direct experience with teaching online, and even fewer had been provided specific training as a part of their teacher preparation (e.g. Barbour, 2012). Kennedy and Archambault (2012) found only 1.3% of U.S. teacher education programmes were preparing pre-service teachers for K-12 online learning by providing field experiences in virtual settings. More recently, Archambault et al. (2016) reported an increase to 4.1% of teacher education programmes who prepared pre-service teachers for online learning. Further, Archibald et al. (2020) indicated similar findings when they found 32% of Canadian teacher education programmes offered field experiences in K-12 online programme settings to pre-service or in-service teachers. This problem was compounded by the fact that researchers behind the "Going Virtual" studies into K-12 online teacher professional development found that less than 40% of all K-12 online teachers reported receiving professional development prior to beginning to teach online (Dawley et al., 2010; Rice and Dawley, 2007; Rice et al., 2008). Similar findings have been reported in India (Nautiyal & Sinha, 2015), the United Kingdom (Kidd

& Murray, 2020), and elsewhere (Bacsich et al., 2012a, 2012b). For example, Coyle et al. (2010) found that Spanish teachers were unprepared to engage in digital teaching techniques in their own instruction, while more recently the European Commission (2020a) reported that less than half of teachers had any formal information and communication technology training prior to the pandemic. Despite the important role European Schoolnet (2017) has played in the wider European context, before the pandemic, learning to teach online had not been a focus area.

AN HISTORICAL GAP IN TEACHERS' PREPARATION TO USE TECHNOLOGY TO TEACH

Shulman (1986) proposed the concept that there was a type of knowledge that went “beyond knowledge of subject matter per se to the dimension of subject matter knowledge for teaching” (p. 9). Today pedagogical content knowledge is embedded in most teacher education programmes. Yet more than 15 years after it was first introduced, Mishra and Koehler (2006) proposed expansion of this framework to include technological pedagogical knowledge has not gained similar acceptance within the broader teacher education community. However, the recent sudden and dramatic shift to technology-mediated forms of learning – such as K-12 online learning – have exposed a long known reality. While some pedagogical skills from a standard teacher education programme still apply, many of the necessary online teaching competencies are completely new to even recently licensed or registered teachers (An et al., 2021; Davis & Niederhauser, 2005; Davis & Roblyer, 2005). For example, the European Commission’s DigCompEdu framework is an excellent example of the gap that exists (Punie & Redecker, 2017). More recently, researchers are still noting a significant gap in many teachers’ skills when it comes to effectively using technology for teaching purposes, and that addressing this gap is an ongoing challenge in teacher education and professional development (Bueno et al., 2023; Ferdig & Pytash, 2021).

An interesting international example of the exposing of this lack of preparation can be found at Monash University in Australia. Out of necessity during the pandemic, the university began to seek out alternative ways for their pre-service teacher education students to be able to undertake the field experience component of their degree (Phillips & McDougall, 2024a). In the post-pandemic examination of this ‘virtual school’ training opportunity, the university recognised the potential impact that the virtual field experience had on the students’ ability to teach with technology (Phillips & McDougall, 2024b), as such the programme was continued and even expanded to include students from an Italian university (Carli et al., 2023). Essentially, the closure of schools worldwide due to the pandemic forced the university to explore alternative solutions to provide their traditional teacher education programming (e.g., Glaser et al., 2021; König et al., 2020; Vu et al., 2021). In doing so, it exposed a gap in teacher’s readiness to teach online that was identified by various researchers (Francom et al., 2021; Trust & Whalen, 2021; Zinskie et al., 2023).

This is not to suggest that teacher education programmes are solely to blame for the lack of preparation witnessed since 2020, or even that the problem began with the dramatic shift to remote learning that was caused by the pandemic. For example, Bond et al. (2019) wrote that “issues of educator professional development with technology have been a particularly recurring theme across the past five decades, with institutions at all levels struggling to find the resources to release educators, or to implement sufficient preservice teacher education with technology” (pp. 39–40). More recently, Lahr and Welch (2023) indicated that while “teacher preparation [had] grown to accommodate and consider virtual teaching practices, to a degree, but integration into pre- and in-service teaching preparation [was] nowhere near universal, and the curriculum of teacher preparation for online teaching [was] murky at best” (p. 162). The reality is that even if teacher education programmes had sought to include this knowledge the research in the field is so fragmented “that teacher preparation programmes cannot even determine what future teachers who may be working in an online or blended environment should be exposed to” (Molnar et al., 2021, p. 69).

RECOMMENDATIONS FOR TEACHER PREPARATION

RESEARCH-BASED STANDARDS

To address this lack of research, Hodges et al. (2022) argued that “a validated set of standards would provide accrediting bodies a guide to effective online teaching practices that could

be used to hold teacher education programmes accountable” (p. 206). The International Commission on the Futures of Education (2021) echoed this point, suggesting that one of the main limitations of teacher education programmes in general was the “lack of standards of practice or of standards for teacher preparation institutions” (pp. 22–23). Hodges et al. (2022) also argued that “metrics and instruments must be created or refined to further assess and support growth of [teacher’s] knowledge, skills, and attitudes of teaching in K-12 online and blended learning” (p. 205). However, in order to achieve specific goals of research-based standards and validated assessment metrics and instruments, scholars need funded efforts to develop promising practices and frameworks that teacher education programmes can use and be evaluated against. Leaving school technologies to the demands of the free market and commercial interests has been observed to have serious problems (Barbour, 2017; International Commission on the Futures of Education, 2021; Krutka et al., 2021). The need for funded research is an area where national and local authorities can play a role to provide encouragement, direction, and – most importantly – resources to ensure the public interest is at the forefront of this scholarship.

Even without this research-based framework, scholars have started to provide recommendations for teacher education programmes in response to issues observed during the COVID-19 pandemic to better prepare teachers for teaching online. Trust and Whalen (2020) recommended to “provide teachers with the opportunity to develop K-12 online and blended teaching competencies so that they are prepared to teach in different formats, settings, and situations” (p. 193). Lahr and Welch (2023) were more specific with their recommendation, stating that pre-service teachers should have experience through an online teaching practicum. Hodges et al. (2022) offered a more detailed list of objectives to improve global teacher preparation for online and blended teaching. Similarly, in their review of global lessons for education from the COVID-19 pandemic, Vincent-Lancrin et al. (2022) suggested that teacher education programmes had an important role to play in addressing the gap between the possibilities related to digital education and the reality that existed in most jurisdictions. The most important of these, at least with respect to the preparation of teachers to be able to teach online, was to ensure that accrediting bodies and state agencies require that all teacher education programmes have meaningful and useful preparation to deliver online and blended learning.

ACCREDITATION BODIES

According to the American Association of Colleges for Teacher Education (2022), “the importance of accreditation, particularly its role in assuring that the preparation of professional educators ultimately serves the interests and learning of PK-12 students [i.e., a US-term used to describe pre-kindergarten to the final year of secondary school]” (para. 2). While this is an American organisation and example, the same would be true of the national and professional accrediting bodies of any European nation. As Hodges et al. (2022) noted that one of the main reasons why teacher education programmes have “not normalised the preparation of all teachers to teach effectively with technology, including in different modalities such as online and blended learning” is because they haven’t been required to do so (p. 207). In fact, often the stated requirements for teacher education are so expansive and onerous that they account for most, if not all of the allocated focus within the teacher preparation programme.

FOCUSED COURSE WORK

Hodges et al. (2022) also recommended that there must be sufficient course work in teacher preparation programmes to give teachers access to knowledge, skills, and attitudes related to K-12 online and blended learning. How to provide that coursework is a matter of debate. Starkey (2020), in a systematic literature review of teacher preparation for the use of digital technologies, found that from 2008–2018 “perspectives ranged from having standalone courses with no link to in school practice to teach generic digital competencies, to a view that programmes should have digital competencies infused across courses” (p. 52). That observed range, from standalone courses to infusion across the teacher preparation curriculum, has been reported by several other scholars (Brush et al., 2001; Foulger et al., 2019; Mehlinger & Powers, 2002), many of whom have noted apparent problems with how the technology infusion approach is often implemented (Clausen, 2022; Wetzel et al., 2014). Regardless, it has

been recommended by some that teacher education programmes should stop the pendulum-like swing between a course and infusion in the middle by including specific coursework and infusion throughout the teacher education programme (Mellon, 1999; Wang & Chen, 2006).

EXPERIENCE AS ONLINE LEARNERS

Further, Hodges et al. (2022) recommended that teacher candidates should have experiences as online learners. It has been long accepted that online teachers should experience online learning as a student. As Zucker and Kozma (2003) indicated, in order to fully appreciate the challenges that students may face, teachers need to first have the experience of being an online student themselves. In fact, one of the first virtual schools in the US built this into its initial teacher induction programme. In order to design an online course or teach an online class, you had to first complete an online course in either effective online course design or effective online teaching (Pape et al., 2005). This model is based on the belief that “teachers teach the way they were taught” (Davis & Rose, 2007, p. 7) – and in order to be able to teach online one must experience being taught online themselves. The authors also suggested it was “important for all online course designers and instructors to have professional development that uses the online media they will be teaching through” (p. 7). Similarly, Cavanaugh (2009) also believed online teachers needed to have experience as students in an online learning setting. Essentially, by having the experience of being an online learner, it would provide teachers with a sense of empathy for the struggles that their own online students might face – which should enhance student learning (Bouton, 2016; Meyers et al., 2019). Additionally, Akcaoglu and Akcaoglu (2022) wrote that having teachers experience effective online learning would increase their own self-efficacy about teaching online, which according to Correy and Stella (2018) would also lead to greater student success.

FIELD EXPERIENCE

Finally, recommendations have been made for quite some time that pre-service teachers need to be prepared to teach online. For example, Duncan and Barnett (2009) concluded that “future teachers must have the skills and knowledge to teach effectively in online as well as in traditional environments” (p. 373), while König et al. (2020) found there was a need to foster teacher expertise in online teaching and learning both in initial teacher preparation and on-going teacher professional development. Yet despite calls like these, most teacher preparation programmes are not addressing this need (Kennedy & Archambault, 2012; Archambault et al., 2016; Archibald et al., 2020). The COVID-19 pandemic exposed the critical need for all teachers to be prepared to teach online. An important component of this preparation appears to be a field or practicum experience in online teaching. Luo et al. (2017) observed that pre-service teachers being exposed to an online teaching field experience had many benefits, including positive attitudes toward online learning, the possibility of positive relationships between teachers and students online, and their ability to create interactive learning online. More recently, Mohebi and Meda (2021) found that a “virtual field experience was a milestone of achievement for trainee teachers” (p. 1196). These findings should be no surprise as teacher education has routinely included field experiences for in-person teaching for decades (Cruickshank & Armaline, 1986). Thus, teacher education programmes should also include field experiences in online learning (Hodges et al., 2022).

A NEW SOCIAL CONTRACT FOR TEACHER EDUCATION

As the International Commission on the Futures of Education (2021) indicated, “key responsibilities fall to governments whose capacity for the public financing and regulation of education should be strengthened” (p. 4). This sentiment is true not just of the provision of public education, but also in the preparation of the teachers who work in the public education system. As the commission succinctly summarised:

The continued development of digital technologies in education in directions guided by sustainability, justice, and inclusion will require action from governments, support from civil society, and a broad public commitment to treating education not as an arena for profiteering, but as a space for public investment in sustainable, just, and peaceful futures. (p. 10)

There must be a public investment into research that develops promising practices and frameworks that teacher education programmes can use and be evaluated against. Then teacher education programmes need to use that research to provide teachers with experience in designing, delivering, and facilitating instruction, as well as the opportunity to learn online themselves. In Europe, the European Commission has an important role to play in supporting research and helping member states to develop policies that prepare teachers to harness the potential of digital education (e.g., the European Commission's [2020b] *Digital Education Action Plan*). In fact, Montiel et al. (2021) reported based on their research that international and multi-national organisations – such as the European Commission – are better placed to guide, and even accelerate, the development of educational strategies and initiatives designed to address the gaps exposed by the pandemic (such as this one with respect to teacher preparation).

Widespread readiness for remote online learning prior to COVID-19 was limited by various factors such as funding, infrastructure, and technical capacity. There were, however, warnings that were either unseen or not addressed. For example, the U.S. Department of Education recommended that schools develop continuity of learning plans in response to possible pandemic flu as early as 2006 (U.S. Department of Education, 2006), and as early as 2010 the U.S. Department of Education (2010) had observed that:

As online learning becomes an increasingly important part of our education system at all levels, this creates both the need and opportunity for educators who are skilled in online instruction and the demand for greater knowledge of the most effective practices. (p. 47)

These warnings were not exclusive to the United States. Other countries have been prepared for alternate delivery of instruction for some time. For example, Singapore has prepared to respond to a pandemic or natural disaster through annual drills for online learning (Barbour et al., 2020). Historically, in 1948 New Zealand employed correspondence education and educational radio during a polio epidemic (German, 2020). More recently, Hong Kong learned valuable lessons from SARS and H1 N1 that were useful during this most recent pandemic (Alpert, 2011; Latchem & Jung, 2009), as did Bolivia (Barbour et al., 2011). Finally, in addition to instances of disease or disaster, the preparation to teach online would also help to mitigate the impact on schooling in areas of conflict, such as the one presently occurring in Ukraine.

The world does not need to be caught off guard again with respect to the need to deliver quality education in the time of disaster. In their rather direct assessment, Stracke et al. (2022) remarked:

The biggest challenge arguably lies in training and upskilling professionals, either collectively or individually. Distance teaching revealed strong disparities with technology abilities that presented a training challenge. The different (and often missing) abilities and competencies of teachers, trainers and support staff to use existing tools or to appropriate new environments, sometimes inadequate or insufficient, led to diverse and complicated solutions. (p. 17)

Our vision is that a new social contract for teacher education includes preparation of all teachers to be able to deliver quality instruction online if needed. Additionally, as Darling-Hammond and Hylar (2020) remind us, this recommendation is not exclusive to students' academic needs. The lack of preparation of teachers to fully engage students in online environments also had impacts on students' social emotional needs, creating greater expectations for teacher education programmes to be able to equip teachers for equity-focused teaching and learning – even in online settings. To achieve this vision governments must provide funding for scholars to develop and disseminate the necessary tools for effective practice and evaluation of online teaching, and teacher education programmes around the globe must reform to incorporate preparation for online teaching, not as a novelty, but as part of the standard course of teacher preparation. As König et al. (2020) concluded, “preparing teachers for the digitalisation in schools can [and should] be regarded as a chance that teacher education should not miss” (p. 12).

CONCLUSIONS

It is often said that you campaign in poetry, but you govern in prose. In *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*, Christensen et al. (2008) predicted that by the end of the next decade that half of all learning in the United States would be done online. The prediction was based on their premise that schools had adapted well to the demands of society and had changed dramatically over time – with the authors citing examples such as (1) the transition from one room schools to larger, industrial-size schools, (2) the desegregation of schools following *Brown v. Board of Education*, (3) the focus upon mathematics and sciences after the Soviet launch of Sputnik, (4) the broadening of the curriculum (such as Advanced Placement or International Baccalaureate), (5) the expansive testing regimes put in place under the No Child Left Behind legislation, among others. While all of these examples represent change in the education system (at least the US education system), do any of them represent a fundamental change in the nature of schooling?

Would any of these changes have made a difference in what someone would see if they walked into a classroom in the year 2008, as compared to walking into a segregated classroom in the American south in the 1950s? Or into a one-room school in rural Australia in the early 1900s? How about as compared to walking into the University of Bologna, the University of Paris, or the University of Oxford in the 1200s? Or even if that individual were walking the streets of Athens listening to Socrates himself? The fact is that the actual act of teaching and learning that occurs within the classroom hasn't changed all that much since the first "schools" were created (Barbour, 2009). The pandemic-induced worldwide closure of schools and the provision of learning through technology-based remote education was a fundamental change in the nature of schooling. This sudden pivot to remote learning, along with the subsequent calls for fundamental changes to both how we provide formal education and how we prepare those who facilitate that education, invite us to be poets.

The poetry that we wish to write is based on a vision of equipping teachers with the skills to effectively teach in both face-to-face and online learning environments – to allow an education system where the quality of learning is not based on the medium in which that learning occurs. In order to achieve that vision, we propose the following goals for teacher education. (1) While there is an abundance of research to guide teacher education on how to prepare educators for the face-to-face classroom, there needs to be funded efforts to develop promising practices and frameworks that teacher education programmes can use to prepare educators to be effective in the distance and online learning environment. In order to achieve this first goal, (a) validated, research-based standards must be developed and (b) metrics and instruments must be created or refined to assess and support growth of teacher's knowledge, skills, and attitudes for teaching in the distance and online learning environment. (2) While content related to teaching with technology is often included in teacher preparation, teacher education programmes must fundamentally change their focus to include teaching in distance and online environments in the same pervasive manner as teaching in the face-to-face classroom. In order to achieve this second goal, we need (a) accrediting bodies and state agencies to require teacher education to prepare educators to deliver online learning, (b) sufficient course work to give educators the necessary knowledge, skills, and attitudes related to distance and online learning, (c) educators to have experiences as online learners themselves, and (d) the opportunity – even requirement – for educators to undertake field experiences in distance and online learning settings.

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS (CRediT)

Michael Barbour; conceptualization, project administration, resources, supervision, validation, visualization, writing – original draft, writing – review & editing; Charles Hodges; conceptualization, project administration, resources, supervision, validation, visualization, writing – original draft, writing – review & editing;. All authors have read and agreed to the published version of the manuscript.

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TO CITE THIS ARTICLE:

Barbour, M. K., & Hodges, C. B. (2024). Preparing Teachers for Effective K-12 Online Learning in the Age of Disruptions: A Call for Transforming Teacher Education. *Open Praxis*, 16(4), pp. 583–594. <https://doi.org/10.55982/openpraxis.16.4.727>

Submitted: 13 July 2024

Accepted: 22 August 2024

Published: 29 November 2024

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Open Praxis is a peer-reviewed open access journal published by International Council for Open and Distance Education.