DISTANCE EDUCATION FOR TEACHER TRAINING:

Modes, Models, and Methods

Mary Burns
Education Development Center, Inc.
Washington, DC

EDC Education Development Center

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Dr. Barbara Moser-Mercer, Visiting Professor, University of Nairobi, Coordinator African Higher Education in Emergencies Network (AHEEN), Nairobi, Kenya

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Ee-Reh Owo, Schools Director, Justice Rising, Democratic Republic of the Congo

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Dr. Torrey Trust, Associate Professor, Learning Technology, College of Education University of Massachusetts Amherst, USA

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About the Author

Mary Burns is a senior technology and teacher professional development specialist at EDC. A former 10-year teacher in the United States, México, and Jamaica, she has worked in the area of technology-enabled professional development since 1997, instructing, designing, and evaluating both distance-based and face-to-face professional development for teachers, teacher educators, and instructional coaches. She has authored peer-reviewed papers, books, articles, and blog posts about teacher professional development, distance learning, and teaching with technology. She works in Asia, Africa, the Middle East, Latin America, the Caribbean, Europe, and the United States.

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Section I. Chapter 5

ONLINE LEARNING

Table of Contents

Online learning is arguably the most common form of distance learning across the globe in the most diverse range of contexts.

5.1 Overview

One of the fastest-evolving modes of distance education is online learning—also referred to as *virtual learning*, *eLearning*, or *Web-based learning* (Kizilcec et al., 2017). In the United States, Canada, Europe, Australia, New Zealand, and East Asia—countries in which high-speed broadband access is prevalent, school or home Internet access rates are high, and technology skills are broadly disseminated—online learning is far and away the dominant mode of distance education. It also is increasingly expanding in countries where the above prerequisites are largely absent. Indeed, across the globe, for teachers across a range of wealthy, middle-income, and even low-income countries, online learning *is* distance education.

This expansion is driven by the accelerating rate of global Internet access. As of January 2023, 64.5% of the world's population—over 5 billion people—had Internet access, and 95% had "coverage," that is, they lived within range of a broadband signal (DataReportal, 2023; International Telecommunication Union, 2022; Statista, 2022c). Access across the globe among young users ages 15–24 in particular continues to grow at very high rates (International Telecommunication Union, 2017, as cited in Morris et al., 2021).

The expansion of online learning as an option for teacher professional development stems not just from increasing broadband Internet access but is a result of its multimodal nature. As discussed in the previous four chapters, online learning has appropriated and redefined other modes of open and distance education—print, audio, visually-based distance education, and multimedia forms—to such an extent that in certain contexts these modes are more commonly utilized online versus offline and accessed in digital versus analog form. Thus, for many teachers, online learning has become the most engaging, comprehensive, convenient, and versatile mode of distance education (Burns, in press).

As this chapter will illustrate, online learning for teachers encompasses a wide variety of models. This includes computer-mediated communication (email or communication tools such as *Slack*), self-paced or cohort-based online courses, mini- or "micro" courses, tutorials, e-mentoring, Web 2.0/social media, webinars, webcasts, telecollaborative and tele-research projects, virtual classes, Massive Open Online Courses (MOOCs), and online professional learning communities. This chapter will explore many—though not all—of these models, specifically online courses (asynchronous, synchronous, and bichronous), blended learning and social media.[1]

As we examine online learning in its many iterations and permutations, it is important to be mindful that many of these forms of eLearning, despite their seductiveness, are still evolving.

[1] Chapter 15 will examine online communities of practice and Chapter 16 online coaching and mentoring.

Most of the research that exists appears to be observational versus evidence-based, and often fails to examine *teachers'* experiences of learning. Thus, the degree of rigorous research on the impact of online learning on teacher practice, though expanding, is still less robust than that on other forms of distance education, such as IAI, and is thinner than is the case with face-to-face teacher professional development.

As many readers know too well, the benefits of online learning are powerful but unevenly distributed. Ninety percent of those lacking Internet *coverage* live in Asia, the Pacific islands, or Sub-Saharan Africa (International Telecommunication Union 2017, as cited in Morris et al., 2021). Even where teachers live in areas with Internet coverage, this does not necessarily translate into *usage*. For a variety of financial, technical, or cultural reasons, teachers may not be able to access the existing Internet, know how to use it, or experience opportunities for continuous online learning (International Telecommunication Union, 2022).

The above situation is worse for women, who exceed 60% of the world's teaching force, but use the Internet at far lower rates than do men (Organisation for Economic Co-operation and Development, 2022a,b). The situation is particularly grave in Sub-Saharan Africa, where this gender usage gap is growing (International Telecommunication Union 2017, as cited in Morris et al., 2021, p. 8). Thus, for teachers in many regions of the globe, and especially for female teachers, the online learning activities discussed in this chapter are but a dream.

5.2 Online Learning Terminology

Every mode of distance education has its own terminology, perhaps none more so than online learning. Numerous terms are undefined, ill-defined, erroneously conflated, or rapidly evolving. To better navigate the various online learning options outlined in this chapter, Figure 5.1 offers some essential definitions and clarifications of terminology. As online learning continues to evolve, particularly since COVID, this terminology, too, will undoubtedly continue to evolve. While some terms—asynchronous, synchronous, bichronous, and blended learning—will be examined specifically in this chapter, other terms (remote learning, hybrid learning and cohort-based learning) will receive limited attention. Thus, the reader may find Figure 5.1 to be a useful reference for the rest of this chapter and for Section II, which focuses heavily on methods associated with online learning.

5.3 What Is Online Learning?

Online learning has traditionally encompassed a continuum of practices, centered primarily on the amount of content and interaction with the instructor offered both on- and offline. In the decade following the Sloan Consortium's 2008 seminal classification, the term "online learning" was categorized as any course or program in which at least 80% of content and interactions were offered online. "Blended" or "hybrid" courses were those that offered between 30% and 79% of their content and interactions online, though a substantial component of learning occurred in face-to-face settings. "Web-facilitated" were classified as courses that had some online learning component (1% or more), but the majority of their interactions were face-to-face. "Traditional learning" was 100% in person (Sloan Consortium, 2008).

Even prior to the COVID-19 pandemic, the above distinctions among in-person, online, blended, and Web-facilitated learning began to dissolve into three broader designations—in-person, online, and blended learning. More changes ensued: In 2012, Massive Open Online Courses (MOOCs) burst onto the higher education landscape with much fanfare and even more consternation.[2] But the real game-changer in terms of conceptualization and categorization

[2] The first MOOC was developed in Canada in 2008 (Pérez Sánchez et al., 2017).

Figure 5.1
Online Learning Terminology

Term	Definition

Asynchronous learning	• In asynchronous learning, students learn at different times and places.
	• Examples of asynchronous learning include logging into a Massive Open Online Course (MOOC), a Learning Management System (LMS), or Google *Classroom*, and doing readings, watching videos, authoring a report, and taking a test independent of other learners and at a time and place of one's choosing.
	• Asynchronous learning is often conflated with "self-paced learning." While asynchronous learning typically is self-paced, self-paced learning may be best conceptualized as a subset of asynchronous learning for two reasons:
	  ◦ Asynchronous courses may involve classes with other learners who contribute to a product but at different times. They may schedule live meetings with an instructor or classmates (if these exist). Thus, learners in asynchronous online courses do not necessarily always work alone though learners in self-paced courses typically do.
	  ◦ Asynchronous courses often have a syllabus and activities that must be followed and completed according to certain deadlines. Self-paced courses do not.

Bichronous learning	• The term, "bichronous learning" emerged during remote emergency learning during COVID-19 pandemic school lockdowns. Though the concept is not new the term itself is quite new and therefore not commonly used. • Bichronous learning is online learning that is designed to use both asynchronous and synchronous ways of learning (Martin et al, 2020b). • Examples of bichronous learning include using social media to have a synchronous (live) chat as well as to later curate chat-related resources asynchronously; or an online course that combines weekly synchronous sessions via a Web conferencing platform with individually graded assignments in Google *Classroom* or *Moodle*. • In fact, a far larger percentage of online courses are bichronous because they are designed to have elements of both synchronous and asynchronous learning.
Blended learning	• Blended learning is *instruction* that combines face-to-face teaching with online learning activities. Blended learning used to be synonymous with hybrid learning. This is no longer the case. • Classroom time may be reduced but is not eliminated; rather, time inside or outside of school may be used for online learning activities. • All learners generally engage in the same activities and keep a similar pace. • Teaching activities are designed to capitalize on the affordances of both the online and in-person modes of learning (Broadband Commission for Sustainable Development, 2021; Contact North | Contact Nord, 2020).
Cohort-based	• "Cohort-based" refers to the organization of an online course. It involves a group of online learners who are part of an online course or class, often with an instructor, as in a university based or school district-based online course of a specific duration. • The cohort advances through the course together, meeting specific deadlines for assignments and participating in joint activities often, but not always, synchronously. • Learners in the cohort may or may not work together, though typically they do.

Term	Definition
Hybrid learning	• In hybrid learning, learners enroll to take a course online or face-to-face. Hybrid learning used to be synonymous with blended learning. This is no longer the case. It now refers to the type of *learning institution*, not instruction. • Unlike blended learning, where learners are enrolled in a brick-and-mortar institution but participate in online learning activities, hybrid learning involves some students in the physical classroom while others participate remotely (Broadband Commission for Sustainable Development; 2021; Digital Learning Collaborative, 2020, p. 6). • Learners are *not* required to attend the physical campus on a schedule that approaches a regular school schedule; however, the institution might require students to be on campus a couple of days per week—but never every day (Digital Learning Collaborative, 2020, p. 6). • It enables learners to study in flexible ways, online or face-to-face, according to their circumstances and preferences. • Figure 1.1 in Chapter 1 referred to "dual-mode universities"— educational institutions that offer parallel off-campus and on-campus degree programs, but learners must stay in one track or the other. In contrast, in a hybrid institution this distinction no longer holds. Students can enroll in any type of course—online or face-to-face—simultaneously.
Remote learning	• Coined during the COVID-19 school closures, "remote learning" (or "emergency remote learning") is a *unique type* of online learning—emergency and temporary in nature and specific to a particular context (COVID-19 pandemic school closures). It is also *ad hoc* versus what should be the planned and purposeful design of online courses. • As Hodges, et. al. (2020) note, the primary objective of remote learning was "not to recreate a robust educational ecosystem but provide temporary access to instruction and instructional supports in a manner that is quick to set up and is reliably available during an emergency or crisis."
Self-paced learning	• In self-paced learning, the learner works alone at his or her own pace, completing—or not completing—activities of their choosing. There are no classmates, no set assignments, and no deadlines. • As noted previously, "self-paced learning" is often used erroneously as a synonym for "asynchronous learning." • Self-paced courses typically do *not* have a live instructor, though they may have a prerecorded video-based instructor (such as with a MOOC).
Synchronous learning	• Synchronous learning is the inverse of asynchronous learning—learning occurs at the same time but in different places—and typically involves two-way videoconferencing. • Examples include real-time *Skype* meetings with an instructor (for example, in a tutoring session, class, or meeting, or for office hours) or a *Zoom* class with other learners (as part of a class that meets at specific times).

of online learning was the COVID-19 pandemic beginning in early 2020.

Before COVID-19, online learning, even with the above-mentioned continuum of practices, essentially followed one template—a largely asynchronous course in a learning management system (LMS) that was part of some formal course of study. As a case in point, in 2019, 56% of all U.S. university-based online courses followed this LMS-based model (Garrett et al., 2021). Online learning *may* have involved the use of Web

conferencing tools from time to time—only 1–3% of U.S. universities in 2019 offered predominantly synchronous courses versus asynchronous ones—but this synchronous communication was usually secondary (for "office hours" or tutoring, for example) to the main scope and sequence of the course, which typically occurred asynchronously.

The COVID-19 pandemic and ensuing quarantines and school closures upended this template, both contracting and expanding how "online learning" is conceptualized and implemented. For in-person teacher education programs that were forced to pivot to online instruction beginning with the first pandemic school shutdowns in March 2020, online learning was distilled into—and remains—Web-conferencing–based, synchronous (real-time) classes ("*Zoom* classes").

At the same time, however, the definition of online learning also *expanded*—with online learning encompassing a continuum of practices, content, and interactions that occur online with or without a facilitator. Thus, online learning is now defined as "essentially any learning where more than half of learning takes place via the Internet" (Hoxby, 2017, p. 407). As this chapter will show, this definition unlocks a hitherto closed world of learning opportunities.

In terms of function and purpose, online learning has coalesced into four broad categories.

- **Formal degree programs.** It is used in universities for undergraduate and graduate education as part of formal degree programs consisting entirely of online courses, or including online, face-to-face, or blended courses.
- **Distance education.** It has increasingly become part of distance learning for in-service and pre-service teachers, an approach that has a long history in higher education (Means et al., 2009).
- **Self-directed learning.** It often involves MOOCs, first as online courses open to anyone with an Internet connection and then, increasingly, through fee-based certification programs.
- **Community formation.** For many teachers, online learning occurs through social networking sites where teachers share resources and ideas.

Yet the above four categories do not fully capture the breadth of online learning. For instance, they do not account for the teachers seated across a table from one another at an in-person workshop simultaneously co-creating a Google *Slides* presentation or the informal email or social media-based exchanges of ideas and information among teachers in the same building or formal blended learning. Because the Internet is so ubiquitous, so integral and so embedded into the professional lives of so many of the world's teachers, attempts to delineate and categorize its use are often futile.

5.4 Online Learning for Teacher Education

As suggested above, online learning is arguably the most common form of distance learning across the globe in the most diverse range of contexts. This section provides a geographic overview of models of online learning for pre-service and in-service teacher education.

5.4.1 Online Learning for Teacher In-service Education

A quick global scan of the online learning landscape reveals its prevalence in in-service teacher professional development. In contexts as diverse as Estonia, Uruguay and Egypt, all teacher professional development is offered online. In Europe, the Council of Europe's Learning Modules Online (LEMON) offers 18 practical teaching and training modules for social science teachers across the continent in topics such as digital citizenship, media literacy, social media, and cyberbullying. All courses are offered free of charge and can be accessed via the Council of Europe online platform. Courses vary in length from 2 to 25 hours, catering to the different needs of different categories of learners (Council of Europe, 2022).

In the Caribbean region, the Open Campus of the University of West Indies proffers a range

of teacher education programs—a bachelor's or master's degree in education and a variety of online courses to help teachers gain new skills, upgrade qualifications, or deepen their knowledge of the subject areas they teach. Future and current teachers can take courses from home using *Zoom* and *Moodle* or at one of the Open Campus's 44 distance education centers located throughout the Caribbean (B. Shirley, personal communication, July 18, 2022).

Across Asia, open universities, such as those in India and Nepal, now offer primarily online programs for teacher continuing education. In Qatar, the e-Taleem Online Portal has a catalogue of 55,000 online courses across dozens of degree programs, including in education, for learners in the Middle East and internationally, while the Advanced Learning Interactive Systems Online (ALISON), an Irish for-profit online education platform, has become a popular site for continuous, workplace-based learning, including courses related to teachers and teaching (Hamad International Training Center, 2022; Paudel, 2021) as well as a free course on digital literacy offered in partnership with the mLearning Alliance.

In Sub-Saharan Africa, the Initiative Francophone Pour la Formation à Distance des Maîtres (IFADEM) (2014–2022), a joint initiative of the European Commission and the Organization Internationale de la Francophonie (OIF), provided online training to support the French-language ability of teachers in Chad, Comoros, Burkina Faso, the Central African Republic, the democratic Republic of Congo, Niger, Mali, and the South Pacific nation of Vanuatu (L'Agence Universitaire de la Francophonie, 2017). The African Virtual University, headquartered in Nairobi, Kenya, offers open and affordable distance learning across the African continent.

Even Massive Open Online Courses, which tend *not* to be associated with teacher education, have emerged as a popular form of education for teachers interested in accreditation options (Seaton et al., 2014). A study of the learner population of MOOCs offered by Harvard and the Massachusetts Institute of Technology between 2012 and 2014 found that approximately 40% of participants were past or present teachers (Castaño-Muñoz et al., 2018). Data from Spain confirm a similar high participation rate of teachers in non-teacher training MOOCs (Castaño-Muñoz et al., 2018). These same data also showed that teachers were enthusiastic MOOC participants—significantly more active in forum discussions than were participants from other professions (Castaño-Muñoz et al., 2018).

5.4.2 Online Learning for Pre-service Education

Online learning is not just for in-service education. Though it is still a less common form of pre-service teacher education than in-person programs, that is changing (Koenig, 2020). Over the past decade, many teacher training institutions and universities have refashioned themselves from in-person to hybrid institutions in order to capitalize on the Internet to enhance their outreach and customer base. Online *pre-service* teacher education has experienced enormous growth across the globe. Online universities such Hibernia University (Ireland), Western Governors University (U.S.), and online programs such as *Teacher Training UK* all offer initial teaching degrees online. But online teacher preparation is not simply the domain of countries in the Global North. In Brazil, for example, 67% of entrants in initial teacher education programs are enrolled in online programs (Global Education Monitoring Report Team, 2022, p. 6).

In Sub-Saharan Africa, thanks in part to national research and education networks (NRENs),[3] teacher

[3] NRENs are specialized Internet Service Providers (ISPs) operated for and by the educational and research community of a country. They also are the organizations that operate that network, constituted either as a consortium of members, a dedicated agency, a company, a non-governmental organization (NGO), or other type of body (Foley, 2016, p. 5, as cited in Burns et al., 2019). NRENs are organized into regional backbone networks (e.g., the West and Central African Research and Education Network and the UbuntuNet Alliance for Research and Education Networking).

pre- and in-service education online has expanded in universities in the 32 countries that have these NRENs (Burns et al., 2019). In South Africa, the online University of South Africa (UNISA) prepares almost half of South African teachers (Legodi, 2021). Globally, most open universities are now online universities, and many hybrid universities offer more online options than do either open universities or online universities.

5.4.3 Online Learning for Refugee and Internally Displaced Learners

Over the last several years, online learning has become an increasingly viable option to increase educational opportunities for refugees and internally displaced persons (IDPs)—though the percentage of refugees accessing online learning is still miniscule—approximately 1% (Halkic & Arnold, 2019). Jesuit Commons: Borderless Higher Education for Refugees (JC: BHER) and Jesuit Commons: Higher Education at the Margins (JC:HEM) are two early examples of higher education programs delivered to those living in refugee camps. JC:HEM offered a university-accredited diploma in Liberal Studies to students in Syria, Malawi, Kenya, and Jordan via the learning management system (LMS) *Blackboard* as well as with Google *Drive* and applications such as *Hangouts, Calendar*, and email for content delivery and communication. Courses are designed to be culturally relevant, multicultural in perspectives and design, and delivered using a holistic pedagogical perspective (Mayr & Oppl, 2022). The above two initiatives have blended into Jesuit World Learning, which, as of 2020, offers online and blended certificate programs for educators in Afghanistan, Guyana, India, Iraq, Kenya, Malawi, Myanmar, Philippines, Sri Lanka, and Thailand.

Southern New Hampshire University offers online courses in the Kiziba refugee camp in Rwanda (Mayr & Oppl, 2022). Kiron Open Higher Education, a German non-profit organization, offers refugee learners a two-year online program to assist their completion of studies at a host-country institution (Halkic & Arnold, 2019).

Figure 5.2
Learning Online

Because of the protean nature of the World Wide Web, the boundaries between Web-based models of distance education are more fluid and offer a range of professional development opportunities that are extensive, wide-ranging, and even overwhelming.

Imagine the delight of a teacher in Chuuk, the Federated States of Micronesia, whose island in 2020 finally received Internet access and who has long struggled to better address the diverse learning needs of many of her students. She begins to scour *YouTube* videos to learn more about teaching children with special needs. As she searches through the Internet, she finds a free online course about inclusive education in a Massive Open Online Course at MOOC.org.

But her Web-based learning does not end there: She signs up for monthly webinars offered by University of Toronto's Adaptive Technology Resource Center. She participates in discussions about teaching children with special needs via the University of Buffalo's Assistive Technology Training Online Project and joins *WhatsApp* and *Facebook* groups comprising teachers across the South Pacific region with whom she exchanges resource and ideas. She may burnish her content knowledge at a website like CAST.org and subscribe to Real Simple Syndication (RSS) feeds to access up-to-date content and new podcasts from *Access to Education*, a site dedicated to teaching children with special needs. She may browse other special education activities in any number of national education portals; co-develop a teaching activity with teachers in her *Facebook* group; or browse *Instagram* or *Pinterest* for interesting teaching ideas.

All of these activities constitute online learning. Indeed, online learning is so highly differentiated that, with reliable and robust Internet access, teachers can interact with a host of global resources and peers in a multitude of formats and in ways that are simply not possible in-person, with any other technology, or via any other form of distance learning.

The African Higher Education in Emergencies Network (AHEEN), based in Nairobi, provides accredited university diplomas, primarily through asynchronous learning, for Education in Emergency (EiE) teachers in low-resource refugee and IDP contexts. AHEEN trains faculty (affiliated with refugee-led organizations) in humanizing digital pedagogies through online webinars and asynchronous support so they can prepare their syllabi for remote delivery in low-connectivity contexts (B. Moser-Mercer, personal communication, October 14, 2022). Teachers in Kenya, Niger, Lebanon, and Chad in EiE contexts, can participate in the *Quality Holistic Learning Project*, a self-paced online course that combines virtual learning circles (McKnight et al., 2022).

Finally, as the examples in Figure 5.2 suggest, an enormous, though unquantified, amount of online learning transcends formal online courses—this includes teachers leveraging online resources, such as video sharing sites and blogs, and online communities for self-study. These self-directed online learning activities are widespread and used by teachers across various contexts—in wealthy schools, middle and low-income contexts, and refugee settings—but they not captured by data nor are they recognized officially as formal teacher online learning (Burns, in press).

This chapter now shifts from this high-level overview of online learning for teacher education to a discussion of three main models of online distance education—blended learning, formal online courses (asynchronous, synchronous, and bichronous), and social media.

5.5 Blended Learning

Not all pre- or in-service teacher education will necessarily involve either learning that is entirely face-to-face or entirely online. Increasingly, both pre-service and in-service educational courses combine or blend some elements of in-person and online learning.[4] Because it has emerged as a popular form of teacher professional learning in distance programs, we begin with a discussion of blended learning.

Blended learning has traditionally suffered from the same definitional variability as other online learning terminology (Chigeza & Halbert, 2014). It has been used to refer to learning that occurs both online and offline; learning that employs digital delivery with analog tools (Conn, 2014); technology-assisted learning (Conn, 2014); and learning that teaches teachers while it instructs students (Cardim et al., 2021). It is often synonimized with "hybrid" learning (Sloan Consortium, 2008)—an equivalence that no longer holds true (Broadband Commission for Sustainable Development, 2021; Contact North | Contact Nord, 2020). Thus, the definition of blended learning is often ambiguous and evolving.

This guide uses the standard definition provided by the Christensen Institute, defining blended learning a type of *instruction* that leverages both online and in-person instruction to provide learners with an integrated, more personalized learning experience, including increased student control over the time, place, path, and/or pace of learning (Christensen Institute, 2022).

As discussed in Figure 5.1, online learning is one element of blended learning; the other is in-person learning. Thus, to fully understand *blended* learning, it is important to first consider its benefits and limitations as Figure 5.3 does.

5.5.1 Blended Learning for Teacher Education

While the definition of blended learning may be new, the concept is not. Blended learning has long been part of distance education for teachers. Particularly in open universities, learners have

[4] One study found that U.S. university students prefer online learning for early morning courses and for certain undergraduate course topics (history and government, humanities, natural sciences, and social and behavioral sciences). They prefer in-person learning when courses were offered late morning or early afternoon (Mann & Henneberry, 2014).

Figure 5.3
Benefits and Limitations of In-Person Learning

Benefits of in-person learning	Limitations of in-person learning
• In-person learning humanizes learning. Through the simple experience of "mere exposure" (Zajonc, 1968) and sustained interaction, learners and their instructors form a relationship within a particular content area or area of focus. • It is "high touch" and eliminates the "transactional distance" of online learning—learners separated by geography, time, and technology (Moore, 2013). • It can provide for instruction that is dynamic, spontaneous, and that allows for immediate teacher responses and learner interaction—all of which are difficult to emulate in live *Zoom* meetings or asynchronous classes (Paul & Jefferson, 2019). • It mitigates technical issues. While learners still require telecommunications infrastructure for the online portion of a blended course, their overall education is not threatened by Internet disruptions. • The element of in-person instruction is still important in hiring. For many jobs in education, including teaching, traditional classroom degrees trump online degrees in terms of hiring preferences. Many academic and professional organizations do not consider online degrees on par with campus-based, in-person degrees (Paul & Jefferson, 2019). • It connects learners to a cohort of real (not just virtual) classmates. These relationships are critical for learning, for satisfaction with the learning experience, for persistence, and for successful completion of a learning experience (Paul & Jefferson, 2019). • It can make learning even more flexible—learners may take part in online or in-person learning as they wish. • It offers more just-in-time personalized instruction. The instructor, observing via verbal cues, assessing by walking around the classroom, and engaging in after-class conversations can see where learners need more support or targeted instruction and can provide this (Fabriz et al.,2021).	• In-person learning is often difficult and expensive to scale. • Learning is accessible only to those teachers who are able to attend an in-person workshop; thus, it may be exclusionary. • It is not flexible. Learning occurs at a fixed time and place. It is often not convenient, requires absences from home or work, and may involve considerable effort on the part of the teacher-learner to arrange travel, childcare, time off work, or lessons for a substitute teacher. • Teachers may not interact with technology in an in-person workshop; thus, learning online, for good or for ill, forces teachers to learn how to use technology. • There are high costs associated with in-person professional development—travel of teachers and workshop facilitators, printed materials, rental space, equipment, accommodations, food, etc. • The geographic and temporal constraints of in-person learning mean that it does not hold the same promise for dramatically improved access to postsecondary and continuing education (Jaggars, 2011). • It may not be an optimal fit for learners who are shy, introverted, or don't do well in groups, or learners who may have visual, auditory or mobility issues, if accommodations are not undertaken by in-person professional development providers. • Depending on the nature of the in-person learning, it may be inefficient. While learning behaviors is best done in an in-person setting, learning facts and concepts might be more efficiently learned online. • In large measure, what can be learned is limited by the four walls of the "training room" and the two covers of a book or instructional manual.

long participated in TV or online classes with regular or periodic meetings with tutors in brick-and-mortar study centers.

Blended learning as a form of teacher education makes sense for several reasons. First, teachers and students appreciate the benefits of online and face-to-face learning (Burns, in press). In the U.S., for example, over 20% of U.S. university students reported a preference for online learning, while 29% preferred in-person learning (the most popular modality) (Robert, 2022). Students and teachers see online learning as playing an increasingly important role in their education, even if they prefer in-person learning, because in-person learning provides direct contact with peers (Burns, in press; Robert, 2022).

Next, teaching is a craft-based profession. Teachers can learn concepts online, while face-to-face learning offers them opportunities to collaborate with other teachers to design, microteach, and receive feedback on a lesson or unit.

Third, teachers already spend a lot of their free time online, learning from and exchanging new information with online social networks, which often comprise other teachers who may be outside their immediate school network (Chigeza & Halbert, 2014). Teachers also exchange information and learn ideas from their in-school, in-person networks (Burns, in press). Blended learning allows teachers to leverage both of these opportunities.

Finally, blended learning opportunities can ostensibly offer teachers the "best of both modes"—online and in-person learning—while eliminating many of the weaknesses associated with each, as discussed in Figure 5.3. While offering the best of both modes of learning, it also can enhance the strengths of each mode to create a learning experience that may be qualitatively better than either alone (Chigeza & Halbert, 2014).

Models of Blended Learning

The Christensen Institute (2022) identifies seven models of blended learning that educational institutions can employ—for teachers as well as for their students.

1. Station-Rotation Model. Within an in-person workshop, an instructor sets up several learning stations for teachers, one or more of which involves online activities. Teachers rotate through these stations. Or learners rotate equally between face-to-face and online components of the course on a fixed schedule, with the same teacher for each in-person component and the online component occurring remotely. For example, Education Development Center employed both of these station-rotation models with university instructors from 2015–2019 as part of its USAID-funded project, *Connecting the Mekong to Education and Training* (COMET).
2. Face-to-Face Driver Model. The in-person instructor delivers most of the curriculum and uses online materials to supplement learning. This is a common form of teacher professional development across a variety of contexts.
3. Flex Model. The online component delivers most of the information, while an *in-class instructor* or *facilitator* provides flexible support as needed. This model includes individual and small-group face-to-face tutoring. The University of West Indies Open Campus, for example, employs a flex model.
4. Online Lab Model. The online instructor delivers the course in a brick-and-mortar classroom, but with aides or support staff supervising learners. In the nation of Georgia, the USAID-funded Georgia Primary Education (G-PriEd) Project (2011–2016) used this model to help teachers learn techniques in reading instruction.
5. Self-blend Model. Individual learners take online courses in an *à la carte* fashion as desired. The traditional instruction is brick-and-mortar. This may be one of the most common forms of teacher blended learning across the globe.
6. Online Platform Model. Instruction and materials are all online, with learners taking an

online course remotely. Weekly check-ins with a face-to-face supervisor or the instructor are required. This is a common model in open universities.

7. Flipped Classroom. With flipped learning[5] an instructor may record a lecture, screencast and/or provide access to videos, readings, open education resources, quizzes, and other resources, which pre-service teachers or in-service instructors work through *prior* to coming to an in-person class or workshop. This appears to be the template for many blended courses, including those for refugees and refugee teachers (see below).

In addition to these models, two additional blended learning models are also common in teacher education.

1. Before-During-After Approach. This is like a flipped classroom, but with three phases. In the *before* phase, teachers interact with content; they can replay or revisit parts of what they're trying to learn, take a break, and then come back to the content—something that is not possible in a live workshop. In the *during* phase—the face-to-face workshop—teachers engage in higher-level learning with colleagues and the instructor, creating classroom activities, practicing, evaluating, discussing, and revising these activities. In the *after* phase, also online, teachers engage in another virtual activity that extends or reinforces what they did in the workshop or they receive online support. This three-phased approach provides more "windows of opportunity" for the teacher to actively process information (Doolittle, 2014).
2. Online Courses/In-person Teacher Practicum. This is common in open and online universities where pre-service teacher candidates may be pursuing a bachelor's degree in education. Pre-service candidates take all coursework online, but their teaching practicum is in-person in a brick-and-mortar school.

5.5.2 Examples of Teacher-Focused Blended Learning

Blended learning is expanding as an alternative to purely online or in-person learning for teacher education. For example, Jesuit World Learning (JWL) combines online learning with in-class meetings that take place in local learning centers for teachers in marginalized areas. The on-site learning phases constitute a smaller part of the whole learning experience vis-à-vis the online learning phases (Mayr & Oppl, 2022). A qualitative study involving 80 learners from refugee camps in Afghanistan, Guyana, India, Iraq, Kenya, Malawi, Myanmar, Philippines, Sri Lanka, and Thailand suggests that they valued both the in-person and online interactions, noting that they were "suitable" for providing higher education opportunities for "learners in marginalized regions" (Mayr & Oppl, 2022, p. 3).

ProFuturo is a Spanish digital education program that promotes technology integration to support innovative instructional practices. It employs a blended teacher professional development program in 40 countries with a network of 1.2 million teachers. In addition to using in-person and online approaches, *ProFuturo*'s blended learning model involves an online component for schools with Internet access and a computer-aided instruction (CAI) model for schools without Internet access (C. Gallego Garcia, V. Cruz Gomes, A. Sánchez Rodríguez, personal communication, November 24, 2022).

In a study of *ProFuturo*'s blended approach, in Luanda, Angola, researchers employed a randomized field experiment to assess its impact on 42 primary schools. Twenty-one schools were randomized to receive this blended approach in the beginning of 2018 and another 21 in 2019. The evaluation reported a number of successful teacher-related outcomes associated with the approach. These included increased familiarity

[5] For practical information on flipped instruction, visit Martha Ramirez's site on designing flipped lessons: https://martharamirez.com.co/blog/designing-flipped-instructions-for-differentiation/

with and increased use of technology for both teachers and students, increases in teachers' motivation, and reduction in teacher absenteeism. Results should be interpreted in light of the fact that school principals selected the teachers from their school to participate in this study, based on their motivation, technological skills, and availability (Cardim et al., 2021).

5.5.3 Research: Blended Learning for Teacher Education

Most of studies on blended learning examine general university courses, not teacher education programs. Not surprisingly, however, empirical studies have both supported blended learning or found no superiority to in-person learning. For instance, Escueta et al. (2021) reported on two experiments examining blended learning environments at a U.S. university. One compared outcomes for a statistics course in which one group of learners received three hours per week of face-to-face instruction time, while another group received only one hour of instruction time but additional Internet-based exercises. The second experiment evaluated the effects of reducing face-to-face time in an economics course where all students also had access to online resources. Neither experiment found significantly better outcomes associated with more in-person class time in a blended learning context (Escueta et al., 2021, pp. 930–931).

A U.S Department of Education meta-analysis (Means et al., 2009) found that instruction that combines both face-to-face and online learning elements produced a greater impact than did instruction using only one or the other of these modes. Positive effects for online learning outcomes were stronger when contrasting blended online courses with face-to-face courses versus fully online courses to face-to-face courses. The study's authors note that the observed advantage for blended learning conditions is not necessarily rooted in the media used *per se*, but rather is reflective of differences in content, pedagogy, and learning time.

A further review of experimental and quasi-experimental studies that contrasted different types of online learning practices found that in studies examining blended versus purely online conditions, student learning was usually comparable across both (Means et al., 2009). These results are in keeping with an earlier meta-analysis which found that blended learning may actually provide a qualitatively superior form of professional development than either online or face-to-face learning alone (Zhao et al., 2005).

In one of the most rigorous studies on blended learning, Alpert et al. (2016) tested the impact of an undergraduate economics course of two treatment arms—one purely online and one blended—along with a fully face-to-face control group in a single experimental context. Using an experimental design, researchers randomly assigned learners to one of three delivery modalities: classroom instruction; blended instruction with some online content and reduced instructor contact; and purely online instruction. The authors found that learners in the purely online version of the course did not perform as well as those in the in-person group (learning outcomes were 5 to 10 points lower on a cumulative final exam), while outcomes for the blended treatment group, although not statistically significant from the control group, had outcomes that appeared equivalent to learners in the face-to-face course (Alpert et al., 2016).

A final set of information comes from EDC's online coaching/one-computer pilot program in Indonesia (2008–2010) as part of the USAID-funded Decentralizing Basic Education 2 project. The coaching program had two goals: One was to help teachers integrate one computer in learner-centered ways with 40 students. The second was to build a teacher support system by developing a cohort of highly skilled school-based coaches.

In this approach, Indonesian coaching candidates (former teachers, master trainers, and content area supervisors) received two weeks of face-to-face instruction in coaching techniques—for example, conducting classroom observations and inter-rater

reliability testing on classroom observation instruments in actual classrooms. Following the in-person orientation, they participated in a 10-session, 21-week online learning course, *Strategies and Techniques of School-based Coaching*, in which the coaching candidate learned a particular strategy online and, together with his/her school-based coaching partner, applied this coaching technique with teachers. Examples include holding productive meetings, helping teachers design a lesson plan, co-teaching a one-computer classroom activity with teachers, and observing and providing feedback to teachers. To determine which model of online learning best suited the continued development of *coaching* skills, coaching candidates also received ongoing support from a mentor—either fully online, blended, or in-person—as part of their coaching formation.

To determine which model of distance learning best suited the development of *teachers' integration of technology*, EDC created three models of coaching: a purely online version (100% of instruction and support online), a blended version (50% of instruction and support online and 50% in person), and a 100% in-person version.[6] Teachers were not randomly assigned to one of the three groups; rather, schools were assigned to each group based on the availability and robustness of the school's Internet. Thus, the results discussed below are not generalizable (Burns, 2013).

These two aspects of the program were evaluated —coaching skills and teaching skills.

EDC's published and unpublished internal data showed that teachers in the *in-person* coaching version performed better than their colleagues in either the hybrid or online program on the following measures: collaboration with colleagues, lesson design, and learner-centered instructional practices. Teachers who received blended coaching scored higher on constructs measuring relationships with students and in their ability to use technology. All results were significant at $p > 0.05$. All teachers in the fully online coaching arm had lower scores on all measures than both their blended and in-person counterparts.

Coaches who received either in-person or blended mentoring and provided both in-person and blended coaching to teachers scored higher on measures of the "coaching process" (a set of behaviors related to coaching), instructional methods, and instructional design skills than did coaches who received fully online mentoring. These "blended" and "in-person" coaches saw consistent improvements in their understanding of teacher capacity-building and their ability to support teachers. Like teachers who received online coaching, the online coaches themselves showed the lowest gains in measures of coaching efficacy—in some cases regressing—even though they started at a higher base level. This suggests that both blended and in-person models were successful in imparting key learning objectives related to instructional coaching.[7]

What the above results appear to show is that in-person learning has an important role to play in online and, indeed, in all forms of distance education. Put another way, interventions *without* some degree of face-to-face teaching may result in poorer learning outcomes or a less satisfactory learning experience. But importantly, while far more rigorous evidence is needed, it does suggest that switching courses from fully in-person to blended might decrease costs without negatively affecting quality (Escueta et al., 2020, p. 931).

We now move to a focus on formal online learning.

[6] Because it involved text-based communication and email, it was referred to as "Web-facilitated" versus "in person" in the original design.

[7] This is based on unpublished raw data.

5.6 Online Courses: Synchronous, Asynchronous, and Bichronous

Online learning is highly platform-driven, and the ways teaching and learning occur online is inexorably linked to its model of delivery (Commonwealth of Learning, 2008). The architecture of the platform defines the type of learning and communication—whether, as Figure 5.1 discusses, learning and communication are asynchronous, synchronous, or both ("bichronous").

As a result of this, online learning has been typically segmented into two overall learning "types" or pathways—synchronous or asynchronous courses—which differ by communication tools, feedback types, input methods, collaboration modes, and the skills targeted (Xie et al., 2018). A third variation—bichronous learning (Martin et al., 2020b)—combines traits of both synchronous and asynchronous learning. As seen below, these online learning types are largely platform dependent; thus, to understand the type of learning, it is also important to understand the platform.

This section examines online learning as formal online courses. Before doing so, two caveats frame its organization. First, despite sharing several defined characteristics, synchronous and asynchronous courses are not uniform environments but offer a variety of different options for teaching and learning (Fabriz et al., 2021). Second, though platforms lend themselves to synchronous or asynchronous learning and communication, this is not a hard and fast rule. Though it's logistically challenging, for example, a MOOC platform can support some degree of synchronocity (learners engaging ina simultaneous discussion). Similarly, a tool like social media, which is often considered synchronous, may be used in both a synchronous or asynchronous fashion. Thus the degree of synchronocity or asynchronocity of an online learning platform is often, though not always, defined by intent and design.

5.6.1 Synchronous Learning

As the COVID-19 pandemic shuttered schools and universities across the globe in 2020, education and learning shifted to online or *Zoom* classes—synchronous online learning via a video conferencing platform or two-way video. Before COVID-19, fewer than 44% of public two-year, 55% of public four-year, and 50% of private four-year universities in the U.S. reported having a video conferencing platform in place. By 2021, those figures jumped to 84%, 88%, and 86%, respectively (Garrett et al., 2021, p. 31). The degree to which video conferencing moved from a peripheral distance education tool to a mainstream one in less than 12 months emphasizes the importance of synchronous learning in managing the learning crisis spawned by COVID-19 pandemic school lockdowns.

Webinars/Web conferencing platforms

The cornerstone of synchronous online learning is the *Webinar.* Also known as virtual seminars, online conferences, live meetings, Web meetings, live classes, or *Zoom* classes—webinars use a Web conferencing (sometimes called "Web seminar" or "two-way video") platform. These platforms allow for real-time professional development with an instructor and a group of teachers, thus simulating an in-person professional development session or actual classroom. Through the use of breakout rooms, "raising hands," polling software, integrated group video, audio, instant messaging (chat), screen sharing, whiteboards, document sharing, and the use of third-party apps (such as *Answer Garden, Padlet,* or *IdeazBoard*), Web conferencing platforms can facilitate real-time interaction between an instructor and small groups of learners. These same platforms also can be used to facilitate teacher learning communities or classroom observations. Every webinar platform requires

a "host," who sets up the webinar and invites attendees through a URL or code.

Webinars,[8] or live online classes, can be part of an ongoing program of online professional development, a prerequisite to formal professional development, or the entire professional development itself. As an example of the latter, from 2020–2022, Education Development Center and Florida State University provided 33 *Zoom*-based workshops to over 900 Lebanese university instructors as part of USAID's Higher Education Capacity Development program. The webinars focused on helping instructors deliver EDC's *Work Ready Now* curriculum to university students; develop skills to effectively teach online; and strengthen the capacity of higher education institutions in Lebanon to design effective synchronous online courses (N. Chervin, personal communication, October 11, 2022).

Webcasts, often erroneously conflated with webinars, also are known as "Web broadcasts" or "one-way video conferencing." They are media presentations, often live or on-demand, presented over the Internet using streaming media technology to distribute a single content source to many simultaneous viewers. Webcasts have a longer tradition in distance learning because of their scale and convenience. Learners can access a webcast of a prerecorded webinar or live lecture via *YouTube* or storage sites such as *Box* or *OneDrive* for later viewing at their convenience. Webcasts, as well as screencasts, a subset of webcasts,[9] have become foundational to blended learning, particularly, flipped learning, as discussed earlier.

Thus, unlike webinars, which theoretically are interactive and involve two-way communication, webcasts use one-way communication (presenter-audience). Like all forms of broadcast, they tend toward didactic and passive learning. As Chapter 3 discussed, research with teachers and university students suggests that webcasts or screencasts, like all video, have unique affordances as a learning tool. Learners can watch and rewatch a lecture at their convenience, particularly before examinations, and evidence suggests that students respond better to the multichannel nature of a screencast (audio, visual, and closed-captioned text, where available) than they do to live lectures (Green et al., 2012).

Synchronous online classes via Web conferencing platforms have had several unexpected ramifications for education in general, such as an increase in home learning and micro-schools (Crawford, 2021). They also have had significant implications for teacher learning. First, they've mainstreamed live, "face-based," cohort-based online learning for educators. This has the double-edged effect of increasing access to learning opportunities that might otherwise be unavailable while at the same time shifting in-person learning, coaching, and mentoring—which many teachers generally prefer and consider as higher quality—to a virtual environment (Burns, in press).

Critics have argued that hour-long synchronous lectures foster learner passivity, while proponents maintain that properly planned synchronous activities increase learner engagement. Both of these statements are true and point to the second consequence of synchronous learning—more than any other type of online learning,

[8] This is where the technical and vernacular meanings of technology collide and blur. Educational institutions often host large meetings through *Zoom* or *WebEx*, which transmit information to a large, dispersed audience; they may mute all participants, disable the chat, Q&A, and hand-raising features, and essentially minimize interaction. Readers may have experienced this and heard the term "webinar mode" used. This guide considers such a practice to be a webcast, versus a webinar, though that distinction is not shared by all institutions or Web conferencing providers. See for example, the University of Michigan's Information and Technology Services: https://tinyurl.com/c5afmtt3

[9] "Screencasts" or "video screen capture" are digital recordings of an event that occurs on a computer screen. They typically contain audio narration and are oftentimes "how-to" videos. Despite this distinction with webcasts, the two terms are frequently conflated. For more information on screencasts, see *Appendix 2: Glossary.*

synchronous learning has forced online instructors to pay attention to design and delivery of learning. The result has been the increasing use of online pedagogies that transcend the classic explanatory and didactic pedagogies used in asynchronous modes of learning toward instructional methods that are more collaborative, exploratory, and active. It is not without substantial effort, and even embarrassment at times, to adopt such approaches in an online environment (as anyone who has struggled to get their learners into a breakout room knows), yet many online instructors have successfully adopted more interactive instructional strategies for Web conferencing platforms, such as *Meet, Zoom,* or *Teams.* These range from simple techniques such as Think/Pair Share, chat storms, visible thinking routines,[10] small-group discussions, and carousel walks to collaborative team-based activities and project-based learning (Burns, 2020b).

Third, synchronous learning has turbocharged hybrid learning, which, as Figure 5.1 explains, is a form of instructional delivery. In a hybrid approach, some learners attend in-person classes while others simultaneously attend the same class via a Web conferencing platform. Hybrid learning expanded during the 2020 COVID-19 pandemic when educational institutions across the globe used this approach to create enough space for social distancing or to allow quarantined students to still attend classes. It also was used to allow international students, who could not travel due to COVID-19 travel bans, to attend their university classes in another country. This shift to hybrid learning has increased access to professional learning for teachers and spurred experimentation with other synchronous technologies like holographic technologies (Burroughs, 2021).

Hybrid learning, though extremely flexible, is particularly challenging instructionally.[11] While it provides greater choice and convenience to learners, instructors must simultaneously instruct learners both in-modalities. This can frustrate online learners who may feel neglected as the remote instructor focuses more on her in-person learners and it can frustrate in-class learners who must contend with the break in flow caused by video lags and bandwidth interruptions. Hybrid learning also necessitates substantial investments in audiovisual technologies that ensure that online learners are seen, heard, and do not feel like second-class citizens. It requires greater attention to lighting, to video that is supported by high-quality audio to capture class interactions and discussions, to shifts in the architecture of audiovisual systems, and to sufficient microphones, acoustic treatments to reduce ambient noise, larger, higher-quality screens, and voice-tracking cameras that follow the speaker.

Finally, thanks largely to synchronous classes during emergency remote learning, teachers of all ages across the globe have burnished their technology skills. They are more comfortable and more skilled in using and teaching with technology than they were before the pandemic (Burns, in press; Pota, et al., 2021).

Virtual classes

Online classes are traditional online options for pre-service and in-service teachers. A variation on this and a second model of synchronous online learning involve *virtual classes*. Virtual classes[12] are primarily a U.S-based phenomenon, though that will surely change. They leverage the Internet to provide access to courses for students in rural areas who typically lack qualified teachers in certain subjects, such as algebra. There are

[10] See these examples from Catlin Tucker: https://catlintucker.com/2020/09/online-learning-thinking-routines/

[11] It is even more challenging for one variation of hybrid learning— "HyFlex" learning—where learners have full control of their modality (face-to-face, online synchronous, or online asynchronous) and decide the activities and time that they will participate online or in-person.

[12] Though this may not be true in practice, virtual classes for the purposes of this guide are distinct from *virtual schools,* which, as discussed in Chapter 13, are mainly online schools for secondary students.

a number of such classes in rural parts of North Carolina, Vermont, Maine, and Louisiana.

Yet, though primarily concerned with delivering curriculum and instruction to *students*, virtual classes in many cases also are focused on the professional development for the *in-class teacher.* The best-known example is the Louisiana Algebra 1 Online project (U.S.), initiated in the 2004–2005 school year[13] to provide online Algebra 1 courses to students in rural Louisiana who lacked a qualified Algebra 1 teacher. Students interacted with the online teacher—who was certified in algebra and thus the teacher of record—primarily through the LMS *Blackboard* and email. As with instructional television, discussed in Chapter 3, students were monitored in class by a teacher who was *not* certified in mathematics. In state-level exams, the online Algebra 1 students performed as well or better than their peers in face-to-face Algebra 1 classes (O'Dwyer et al., 2007).

However, like Portugal's *Telescola* initiative, discussed in Chapter 3, the program also focused on upgrading the skills and qualifications of the in-class teacher. In addition to instructing students, the online teacher coordinated lessons with and provided guidance to the in-class teacher throughout the year, so that the in-class teacher could provide help to students as needed. The state education agency of Louisiana provided professional development to both the online teacher and the in-class teacher and both met for two days during the summer in a face-to-face workshop to plan communication, materials, and instruction. Throughout the school year, the two teachers communicated daily via email and phone calls. Thus, the in-class teacher received pedagogy training and mentoring that helped build his or her capacity for high-quality instruction.

Interviews with teachers and classroom observations[14] suggest that the online Algebra 1 classes improved in-class teachers' content knowledge and instructional practices and helped to support uncertified teachers' efforts toward mathematics certification (O'Dwyer et al., 2007). Like other forms of distance education (such as interactive audio instruction, discussed in Chapter 2), the Louisiana Virtual Algebra 1 Online serves as an example of just-in-time in-class professional development that educates *teachers* as it educates students.

There are few examples of virtual classes outside the U.S. One example, discussed in Chapter 3—*eSgoil*—provides education to learners in remote, sparsely populated western islands of Scotland using live video streaming and other digital tools available through Scotland's national digital platform, *Glow*. In such locations, teachers often also lack qualifications or have limited opportunities for ongoing professional development, though it is unclear the degree to which *eSgoil* classes are also directed toward improving the in-class teachers' knowledge and skills (Kizuka, 2019).

Summary: Synchronous learning

Research on synchronous learning—primarily synchronous classes via a Web conferencing platform—is scant, though the field is increasingly populated by findings on synchronous remote learning during COVID-19 pandemic school lockdowns and gradual re-openings. As universities and teacher professional development programs continue to employ synchronous learning as a major form of online learning, more empirical research should hopefully follow.

Yet the remote learning of COVID-19 pandemic school lockdowns—in wealthy countries, at least—involved live online classes with primary and

[13] It is not clear when this particular state-funded program ended. There are other virtual algebra courses in Louisiana offered by private online providers, but they appear to be solely focused on students as opposed to students *and* teachers.

[14] The author conducted interviews with and classroom observations of in-class teachers as part of this evaluation.

(mainly) secondary and tertiary students,[15] thus furnishing a real-time global study on the learning impacts of synchronous learning in particular and online learning in general. If we follow the data, then synchronous learning was a failure, as corroborated by plummeting test scores and "learning loss" across the globe (Annual Status of Education Report, 2021; Asian Development Bank, 2022; Garrett et al., 2021; National Center for Education Statistics, 2022).

However, while the above is true, it may not be a fair representation of online learning. As Hodges et al. (2020) note, a "temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances" cannot be accurately compared to carefully planned, purposeful online learning. Detailed planning, multiple inputs, opportunities for collaboration and discussion, and iterative design, as Section II of this guide advocates, is critical for a successful synchronous online course. Additionally, *Zoom* classes and remote learning were entangled with too many other confounding variables—the pandemic itself, the health-related and emotional trauma of the morbidity and mortality associated with COVID-19, the panic that accompanied the lunge to remote learning, the need for schools to get an online system up and running, and poor technical infrastructure.

Because synchronous learning via Web conferencing platforms as a major form of online learning is so new, evidence-based data for impacts on *teachers* are particularly hard to come by. A single-group quasi-experimental study with 26 pre-service math teachers in China, using a pre-test and post-test design, showed an increase of 11–15 points in the distribution of total scores following synchronous classes (Jiang & Jiang, 2022).

Figure 5.4 presents findings on the benefits and limitations of synchronous online learning. These findings are not without ambiguity and contradiction. For instance, constant opportunities for contact with instructors and classmates is often cited as critical in online learning success (Berry, 2017; Gray & DiLoreto, 2016; Rizvi et al., 2020; Santally, 2016). Yet, Means et al. (2009) report that within cohort-based synchronous courses, while these support mechanisms may generally influence the way students interact, they do *not* affect how much they learn (p. xvi). Based on findings from a study in a regional Australian university, Nieuwoudt (2020) found that student achievement was *not* affected, whether students attended synchronous virtual classes or watched the recordings of the virtual classes though this finding is not without ambiguity (cf. Fabriz et al., 2021; Malkin et al., 2018).

5.6.2 Asynchronous Learning

As Figure 5.1 outlines, asynchronous learning is temporally and geographically independent. It tends to be more individually based and self-paced, and less instructor-dependent, than synchronous courses (Fabriz et al., 2021). For these reasons, asynchronous online learning is a common form of teacher professional development across the globe. It often consists of individual, discrete courses that may offer some interaction with an online instructor and less—or no—interaction with online classmates. Asynchronous learning may be either full-time or supplementary programs directed toward an advanced degree or promotion or taken for continuing education credit or even enrichment. For example, the Cyber Teacher Training Center in South Korea offers self-directed, self-paced, online courses for primary and secondary school teachers. Online tutorials also are offered, with some courses requiring occasional face-to-face meetings (Latchem & Jung, 2010).

While there are multiple examples of asynchronous online learning—online courses, mini-courses, *YouTube* videos, teachers reading online journals and blogs—this section focuses exclusively on

[15] Early childhood classes were not involved, however. This was perhaps the student cohort most adversely affected by COVID-19 pandemic school closures.

Figure 5.4
Benefits and Limitations of Synchronous Online Learning

Benefits	Limitations
• **Greater motivation.** Learners characterize participation in online synchronous discussions as more focused, more motivating, ultimately resulting in better course performance than in asynchronous discussions (Malkin et al., 2018). • **More positive learning experience.** Learners report a more positive learning experience plus greater support of their basic psychological needs. This includes findings of less procrastination and greater relatedness and learning gains which enhance the overall learning experience and are inked to a higher acceptance of online learning (Fabriz et al., 2021, p. 11). • **Higher completion rates.** Learners are more likely to stay up to date with their assignments, interact more with their peers, report greater engagement in the class, and more likely to complete their course than are learners in asynchronous courses. This is particularly true for traditionally underrepresented learners (McCormick, 2018). • **More interactive teaching methods.** This includes whole group work, discussions, and breakout room discussions that increase opportunities for dialogue and support learner-learner interaction (Malkin et al., 2018). This has been shown to result in significantly higher gains in procedural and social skills, and in learner interest in the disciplinary content (Blau et al., 2017; Burns, 2020b; Fabriz et al., 2021, p. 10). • **Lower transactional distance costs.** Moore (2013) defines transactional distance as the geographic and communication distance-related factors that must be overcome for learning to occur. While some transactional distance occurs in all types of online learning, it occurs less so in synchronous courses because of real-time interpersonal communication, the use of natural language, and immediate feedback (Blau et al., 2017; Fabriz et al., 2021; Moore, 2013). • **Ability to modify and personalize instruction.** While synchronous and asynchronous courses both can change and personalize instruction in response to student needs, synchronous instruction makes this more instantaneous, as instructors can observe and hear directly from learners what they need to have changed and can modify instruction accordingly.	• **Decreased fluency of interaction.** Videoconferencing decreases the fluency of interaction, making interactions slower and attention lower compared to traditional teaching (Rapanta et al., 2020). • **Less flexibility and autonomy.** Because they often are cohort-based, dialogue-focused and may be less structured, synchronous courses demonstrate less of the "any time, any place, any pace" affordances of asynchronous ones. • **More bandwidth intensive.** Synchronous courses require better technical infrastructure to allow for live participation in remote settings. • **Greater psychological toll on learners.** Collectively known as *Zoom fatigue,* conditions such as *mirror anxiety* (which can be triggered by the self-view in video conferences that acts as an omnipresent mirror during social interactions) and *hyper gaze* (perceptual experience of constantly having peoples' eyes in your field of view), both separately and cumulatively, take a psychological toll on learners. Daily participation in synchronous classes predicts these conditions and can result in increased cognitive load, negative affect, including anxiety and depression—conditions that are more likely to impact female, versus male, learners. *Zoom* fatigue is exacerbated when educational institutions and distance education providers struggle with camera policies. (Fauville et al., 2021). • **Physical and ergonomic issues.** Restricted physical movements in synchronous classes (because of the impropriety of getting up and walking around during a live class), ergonomic issues, eye strain, lower lumbar, neck and shoulder pain have all been associated with *Zoom* classes (Fauville et al., 2021).

a well-known form of asynchronous learning—Massive Open Online Courses (MOOCs).

Massive Open Online Courses

Massive Open Online Courses are what their name suggests. They are *online courses* that are *massive*—allowing hundreds, thousands, or even tens of thousands of learners to enroll. They are *open* to any learners, regardless of qualifications or abilities. As of 2021, MOOCs reached 220 million learners globally (excluding China)[16] through 3,100 full courses and 500 micro-credential courses. MOOC provider *Coursera* alone added 21 million new learners in 2021 (Shah, 2021, pp. 1–2).

MOOCs began as a media phenomenon—a "techno-determinist" solution to global educational inequities in the words of some (Weingarten, 2014, p. 1). They promised a high-quality education from the world's best universities for the world's poorest people for free, a pledge that threatened to upset the existing higher education model (Friedman, 2012). Between 2012 and 2015, MOOCs experienced enrollment rates exceeding 25 million (Kizilcec et al., 2017). However, as will be discussed below, as MOOCs evolved, they began to markedly diverge from their origin story. Now MOOCs are mostly known for their huge numbers of learners, for their equally prodigious dropout rates, and for a promise-breaking business model. Consequently, they have been largely bypassed as vehicles for teacher professional development.

MOOCs contain the same set of activities as regular LMS-based online courses—sequenced video-based lectures, readings, problem sets, some form of online (typically closed response) assessments, and a discussion forum. There are essentially three different types of MOOCs.

- **Connectivist MOOCs or cMOOCs** incorporate collaboration and focus on participants building content and connections with other participants. Learning is student-centered, and participants' discussions and interactions are considered to be critical to the course (Amado et al., 2022). They also are sometimes referred to as "constructivist MOOCs."[17]
- **Extended MOOCs or xMOOCs** are similar to the classic pedagogical model used in traditional online university courses, which focuses on content delivery for participants (Amado et al., 2022).
- **Nano-MOOCS or NOOCs** are micro-courses or "nano-courses. Users can achieve a targeted set of competencies in a short amount of time. They often are accompanied by a nano-credential or a micro-credential certifying completion of the course (Basantes-Andrade et al., 2020; Pérez Sánchez et al., 2017).

Because many MOOCs are still free, several studies have pointed to the potential of MOOCs as relevant vehicles for teacher professional learning, promoting new skills and professional improvement, especially for teachers of disadvantaged students (Basantes-Andrade et al., 2020; Castaño-Muñoz et al., 2018; Hertz et al, 2020; Laurillard, 2016; Zhao et al., 2018).

MOOCs for teacher professional development

Despite their relatively small footprint in teacher professional development, there is evidence that teachers, like the population at large, participate in MOOCs for a wide variety of reasons—from practicing skills for school or work to fun and personal interest. In Spain, 81% of teachers participating in the Spanish Ministry of Education's National Institute for Educational Technology and Teacher Education (INTEF) MOOCs, reported participation in a previous MOOC, with 42% completing it (Castaño-Muñoz et al., 2018). Seaton et al. (2014) reported that of 11 MIT MOOC courses (MITx) offered through the course provider *edX* in spring 2014, approximately 36% of course participants identified themselves

[16] This is due to a lack of reliable data.

[17] See *Appendix 2: Glossary* for an explanation of connectivism, constructivsim, and social constructivism.

as teachers. Because many MOOCs are affiliated with universities, they may play a role in pre-service teacher education. However, unlike conventional online courses, MOOCs usually are not part of official degree programs.

There are MOOCs designed specifically for teachers. In Jordan, Edraak ("Realization") is an Arabic-language MOOC platform implemented by the Queen Rania Foundation (Queen Rania Foundation, n.d.).

Spain's INTEF program offers MOOCs (both traditional and nano-MOOCs) to help teachers utilize ICTs to improve teaching and learning. Of the 11,566 teachers participating in the traditional teacher training MOOC and the 3,653 teachers participating in the NOOC version of the course, 57% and 55%, respectively, completed each type of MOOC course (Castaño-Muñoz et al., 2018). Enrollment and completion rates suggest this was a self-selected, rather than representative, group; nonetheless, such high completion rates are encouraging.

Europass Teacher Academy, Europe's largest provider of online professional development for teachers, offers MOOCs among its online offerings for teachers in Europe and across the globe. A core feature of all Teacher Academy courses is that they require participants to transfer their learning into a concrete course output, such as a lesson plan, which allows for easy implementation in their own classroom or school (Europass Teacher Academy, 2022; Hertz et al., 2020, pp. 231–232). In the United States, the Friday Institute for Educational Innovation at the North Carolina State College of Education offers free "MOOC-Ed" (MOOCs for Educators) courses focused on project-based learning, collaboration, and peer-supported learning (Friday Institute, n.d.).

Teacher Education in Sub-Saharan Africa (TESSA) has offered at least two MOOCs, primarily directed at educators in Sub-Saharan Africa and India. One, *Making Teacher Education Relevant for 21st Century Africa* was designed to support Sub-Saharan teacher educators in changing their practice and better support teachers in the new curricula being developed. It focused on active teaching approaches, incorporating ICT into classroom learning and using TESSA's Open Educational Resources (OER), and provided teachers with the opportunity to develop collaborative networks. Approximately 4,444 southern African educators joined the first two versions of this MOOC and over 7,000 educators in all have participated in it, many accessing it via their phones. For many, this was their first experience with online learning (Stutchbury et al., 2019).

The second MOOC, offered through TESS India and entitled *Enhancing Teacher Education through OER MOOC!*, was designed to help teacher-educators become familiar with TESS-India open educational resources (OER), its pedagogic approach, and how materials could be used with teachers. After a pilot iteration, this MOOC was run in English (with approximately 10,000 participants) and then in Hindi (with approximately 30,000 participants) (Wolfenden et al., 2017, as cited in McAleavy et al., 2018).

In Latin America and the Caribbean, the Organization of American States (OAS) offered a hemisphere-wide nine-week MOOC from August–October 2015. Over 6,771 teachers from at least 22 countries[18]—the majority from Ecuador (1,473) and Colombia (1,240)—enrolled in *Pensamiento crítico: un reto del docente del siglo XXI (Critical Thinking: A Goal for the 21st Century Teacher).*[19] Fifty-three percent of enrollees were female and the average learner age was 40. The MOOC was unique in that it employed a team of tutors so teachers could get immediate

[18] 1,066 teachers did not note their country when registering for the MOOC.

[19] The author was part of the evaluation team examining outcomes of this MOOC. The information here is taken from internal documents.

feedback and communicate with a tutor as needed. Eighty-five percent rated the quality of the content "excellent" (the highest rating) and 55% rated the peer interaction as "excellent."

The Commonwealth of Learning (COL) *Teacher Network for Girls Education* project (also known as TEN-G) supports teacher mentors in marginalized communities to adapt COL MOOCs and other Open Educational Resources (OER) training materials for female teachers through on-site training and other blended learning opportunities. Teachers develop podcasts that are subsequently aired to learners via local radio stations, as well as adapting and sharing other existing OER in their teacher communities (Traxler & Ogange, 2021, p. 7).

While not directed at teachers *per se,* Kiron Open Higher Education, a non-governmental organization supporting refugees in Germany and worldwide (primarily in Jordan), offers MOOCs and other online courses to anyone worldwide with a refugee background. Kiron collaborates with well-known MOOC and online learning providers so that Kiron learners can take the online courses as well as obtain certificates of successful completion, all free of charge. Learners can accumulate up to 60 credit points in two years by completing MOOCs and other online courses. They can then use these credits, recognized in Europe by the European Credit Transfer and Accumulation System (ECTS), to transfer to one of 56 institutions of higher education with whom Kiron partners. The program also offers substantial supports to online learners—study groups, Help Desk, online counseling, online and offline language courses in German, English, and French, and online mentoring are but a few of these services (Halkic & Arnold, 2019, p. 349).

Finally, MOOC platforms, such as *Coursera, Miriadax* (for Spanish speakers), *France Université Numérique* (FUN) (for Francophones), and *edX*, despite their monetization, provide thousands of sometimes free or usually free-to-audit courses of different types and on different subjects. *Coursera* alone, as of January 2023, reported that it offers 8,213 free-to-audit MOOCs and 199 free certificate courses (Class Central, 2023). MOOC-List, a clearinghouse of free online MOOCs, also points the way to courses that would be of potential interest to many teachers. Because of the organization of MOOC-List (it lists courses by start dates in 30-day increments), the exact number of free courses is difficult to ascertain.

Benefits of MOOCs for teacher learning

MOOCs have been a major driver of positive change in online learning.

First, by design, MOOCs have scaled educational opportunities. Via course materials, the volunteerism of MOOC learners, prerecorded lectures, and automatically graded assessments, educational opportunities have been made available to millions of learners worldwide, including teachers (Kizilcec et al., 2020; Kizilcec & Halawa, 2015). While they are increasingly directed at professional learners—those who want to take online courses that are convenient—MOOCs still offer university-level courses that come from a recognized institution, and there is evidence that learners can transfer skills learned from MOOCs into real-world settings (Kizilcec et al., 2020). As of 2022, there were over 70 online degree MOOC programs and some 17,000 micro credentials—some portion of which undoubtedly include teachers (Shah, 2021).

Next, MOOCs also are well-suited to assess the scalability of behavioral interventions. They have a well-defined outcome (course completion) requiring sustained effort, and learner progress is continuously tracked through a common software platform and through automatic assessments (Kizilcec et al., 2020, p. 14,900). Thus, online learning providers could potentially use MOOCs to develop and assess a number of online learning innovations to see what works best and under what conditions.

Third, MOOCs have increased the online learning design IQ of many educators who had never

before seen an online course, and who, thanks to the ability to access free MOOCs, witnessed for the first time the possibilities of online learning. Before MOOCs, a good deal of online learning often suffered from the "old wine in new skins" syndrome—flat, highly text-based content delivered via new technology. In part, this may have been because online learning was a private learning experience, "hidden" behind the walled garden of an organization's LMS so that instructors and designers saw little beyond what they themselves created and learners had no points of comparison by which to evaluate their course design and structure (Burns, 2021).

The first batch of MOOCs was produced by university consortia (for example, *Coursera*) that had access to high-quality production teams, studios, and content. For the first time, many potential online learners and instructors could see carefully designed online courses complete with video, clean interfaces, rich media, automatic grading features, and interactive exercises. Many LMS designers began appropriating some of the best design features of MOOCs for their LMS, and indeed many LMSs have adopted features of MOOC design (Burns, 2021). These design features—platforms with simple accessibility, a clear structure and sequence of the online content, high-quality video—influence the learning experience, and interviews with teachers suggest that they appreciate what many considered the innovative design of MOOC platforms (Burns, 2021; Castaño-Muñoz et al., 2018; Pérez Sánchez et al., 2017).

Fourth, MOOCs did, and still do, continue to provide *à la carte* online learning to those who would be unable to access it through face-to-face means (Burns, 2021). While attrition rates are high for MOOCs, high attrition in and of itself is not a problem if learners get what they need from the course (Escueta et al., 2020; Kizilcec et al., 2020). (They are a problem if learners are supposed to complete the course and if their work is collaboration-dependent.) Many learners in a typical MOOC stop participating because they have learned all they intended to learn. This finding resonates with prior work on attrition in community colleges, where attrition has been interpreted as a sign of success and where progress in a course and learner satisfaction are only weakly related (Kizilcec & Halawa, 2015, p. 5).

Finally, since many MOOCs are affiliated with universities and university consortia, there is a fair amount of foundational research on MOOCs for university learners (which may include pre-service teachers). Many of the most well-known MOOCs are and were affiliated with consortia of large research-based institutions, thus these same entities are responsible for a good deal of the actual experimental studies on the effectiveness, or lack thereof, of MOOCs. This has helped the online education field as a whole (Burns, 2021).

Limitations of MOOCs for teacher learning

Despite their strengths as a tool for teacher learning, MOOCs have several limitations as a distance education tool.

First, though there is research on MOOCs, very little of it systematically analyzes the characteristics of teachers participating in MOOCs or focuses on their perspectives of their MOOC-based professional development. Thus, it is difficult to determine the exact impact of MOOCs on teacher learning (Castaño-Muñoz et al., 2018; Laurillard, 2016). Only a few studies are available to date, and most of the available literature reports only on the design of a single MOOC for teachers. Further, the overall impact on MOOCs' learning outcomes for teachers is difficult to evaluate. Where there *is* experimental research, it has focused largely on issues of completion and on whether and how a range of behavioral interventions can improve MOOC completion rates and extend coverage to disadvantaged groups—for example, by increasing interest, effort, and persistence (Escueta et al., 2020, p. 939).

MOOCs have a third problem in determining their effectiveness. Since they generally do not substitute for face-to-face courses that pre-service and in-service teachers would otherwise take, they lack a "clear counterfactual" (Escueta et al., 2020, p. 938). Thus, since they have no single function, no specific role they seek to fulfill, and no institution they attempt to replace, there is no clear experimental evidence on their overall affect (Escueta et al., 2020). This absence of hard data has contributed to much of the criticism about MOOCs.

Fourth, the whole concept of MOOCs contains the seeds of their own demise. The massiveness of MOOCs has real drawbacks in terms of quality online learning—depersonalization and a lack of focus on instruction. Though MOOCs have "discussion" forums, they do not mimic small-group discussions in face-to-face, or synchronous, or even LMS-based classes, where students can get to know each other, exchange questions and concerns, and speak with the professor or a teaching assistant. Instead, they often serve as help forums or places for questions and answers (Krause, 2014, p. 2; Laurillard, 2016). Because courses are so open, temporal, and flexible, many of those who enroll in MOOCs have no intention of participating, and those who start with good intentions still may drop out because there are no costs or consequences for quitting (Escueta et al., 2020; Kizilcec et al., 2020; Krause, 2014). As Krause notes, being able to "study anywhere, anytime" can easily result in "studying nowhere, no time at all" (Krause, 2014, p. 3).

This leads to a fifth, and more serious, allegation against MOOCs—their low completion rates, often in single digits (Escueta et al., 2020; Halkic & Arnold, 2019; Kizilcec et al., 2020; Laurillard, 2016). As Kizilcec & Halawa's (2015) examination of 67,000 online learners in 21 MIT MOOC courses reveals, this low completion—or high attrition—rate falls disproprtionately on more traditionally underserved groups, such as female learners and those in low-resource contexts.

These initial findings are corroborated by more recent research. Kizilcec et al.'s (2020) examination of 269,169 learners from all countries across 247 Harvard, MIT, and Stanford MOOCs noted that learners in the Global South were less successful in course completion. An earlier study by the same lead author found that MOOC learners in Africa, Asia, and Latin America scored substantially lower grades and were only half as likely to complete their courses than were learners in Europe, Oceania, and North America. Women also exhibited lower persistence and performance than did men (Kizilcec & Halawa, 2015).

There are data refuting such high attrition rates. TESS India's *Enhancing Teacher Education Through OER MOOC!* reported a completion rate of approximately 50% across two iterations of the course (Wolfenden et al., 2017, as cited in McAleavy et al., 2018). Stutchbury et al. (2019) reported relatively high completion rates across the two iterations of *Making Teacher Education Relevant for 21st Century Africa* (37%), and 39% of teachers completed all six modules in the OAS's MOOC *Critical Thinking, A Goal for the 21st Century Teacher*.

Further, as noted in the discussion on MOOC benefits, certain researchers caution against characterizing attrition as success or failure, noting that high attrition rates are not necessarily bad nor *ipso facto* signal a problem (Escueta et al., 2020; Kizilcec & Halawa, 2015). Many students enroll with no intention of completing the MOOC, but this doesn't make the course less useful (Escueta et al., 2020). Further, unlike traditional courses, MOOCs represent a shift from traditional online learning models, where learners must remain in a course until it is finished, to a more "user-centric" model, where learners take what they need and move on (Kizilcec & Halawa, 2015, p. 1).

Nonetheless, from an educational resource investment perspective, high attrition—or drop out—rates are troublesome and vexing. They often occur even where sufficient supports have been provided, as in Germany's Kiron initiative

(Halkic & Arnold, 2019). Low completion rates may reflect missed learning opportunities that could be avoided with modifications to the MOOC platform (Banerjee & Duflo, 2014, as cited in Escueta et al., 2020). Pérez Sánchez et al. (2017) suggest nano-MOOCs or NOOCs with micro-credentials as a more realistic option to traditional, longer MOOCs (such as xMOOCs and cMOOCs). Despite these suggestions, Kizilcec et al. (2020) found that no one intervention or set of interventions works in all contexts, concluding that further research is necessary to predict in advance what interventions will help populations of students in need (pp. 14,903–14,904).

A sixth critique of MOOCs is that they essentially represent one step forward for technology and two steps backward for instruction. Further, this poor instruction or, more accurately, the absence of instruction, has not received the attention it deserves (Laurillard, 2016). MOOC platforms are essentially built to deliver content, especially video. This, combined with large class sizes impedes interaction and collaboration. Discussion forums in MOOCs tend to be used for question-and-answer (Q&A), rather than for peer discussion (Hollands & Tirthali, 2014, as cited in Laurillard, 2016; Krause, 2014; Pérez Sánchez et al., 2017). As Chapters 14 and 15 will discuss, opportunities for peer collaboration are major factors in satisfaction with and completion of online learning experiences.

Krause (2014) suggests that MOOCs may work best not as courses *per se*, but as a type of online interactive textbook on topics that scale well and can easily be updated or as resources around a particular topic or ongoing training, akin perhaps to Purdue University's Online Writing Lab, which provides valuable writing advice and stylistic information for free, as well as a place to share writing. In both models, MOOCs could provide interested teachers with a community-based educational experience. Seaton et al. (2014) propose two more potentially valuable uses of MOOCs for teachers—encouraging teachers to use elements of the MOOC (videos, for example) for their own self-study, synchronized to their own schedules, and to enroll their students in MOOC courses and be given control over assignments and grading.

Finally, many proponents originally argued that MOOCs would benefit people from the low-income countries who lacked access to quality education (Friedman, 2012). Though MOOCs do include learners from disadvantaged groups who are formally excluded from access to higher education, they are to a large extent employed by people who already hold university degrees and study for professional development (Halkic & Arnold, 2019). There also is evidence that MOOCs are better suited to teachers with skills more amenable to success in online learning, such as high degrees of self-regulation and better digital competencies (Castaño-Muñoz et al., 2018).

MOOCs did not achieve their potential of scaling free, high-quality education to the masses. Within a decade of their launch, MOOCs have become a big business—generating over half a billion dollars annually (Shah, 2021). As this occurred, their definition of "free" changed to "free-to-audit" (Shah, 2021). Online learning consortia such as *Coursera, edX,* and *Future Learn* have been purchased, become publicly traded, or become for-profit companies offering subscription services.

Thus, while teachers in the Global South may still audit a MOOC, dreams of free Harvard degrees that accompanied the genesis of MOOCs have evaporated. MOOC companies increasingly offer certification programs for a fee, such as Micro Masters programs, and MIT has launched a MOOC-based program that will lead to a traditional master's degree. At present, however, the vast majority of free MOOCs are affiliated with non-elite universities, and the majority of new courses on platforms such as *Coursera* are developed by businesses, not universities (Shah, 2021).

Figure 5.5:
Findings: Asynchronous Online Courses

Benefits	Limitations
• **Reports of higher test scores.** In a study of 3,056 students and 396 online instructors in a German university, learners in the asynchronous group reported higher scores, which was also confirmed by corresponding results from instructor surveys (Fabriz et al., 2021). • **Flexibility and convenience.** Asynchronous courses, particularly self-paced ones, offer "any time, any place, any pace, any amount" of learning. • **More media-focused and content-oriented.** Because learning is mediated primarily via content versus other learners or an instructor, asynchronous courses tend to be more content-focused. Where there are instructional methods tied to asynchronous settings, they tend to focus narrowly on facilitating student interaction with the learning materials (Fabriz et al., 2021). This narrow focus can be beneficial to many learners and instructors. • **Greater autonomy.** Learners in asynchronous courses report more autonomy versus those in synchronous ones (Fabriz et al., 2021). [Since asynchronous courses require learners to exercise more autonomy, this ability to be self-directed and autonomous matters more in terms of completion (Berry, 2017; Moore, 2013)]. • **More useful for discussing complex ideas or deep reflection.** Cognitive achievement, such as producing meaningful and thoughtful ideas and products, can be greater in asynchronous settings (Ogbonna et al., 2019). • **Greater gains in self-directed learning.** However, no differences were found in students' learning gains regarding content skills, vocational skills, and digital skills (Fabriz et al., 2021).	• **Require more careful design.** Asynchronous courses that facilitate social interaction, such as discussions in online forums, require more attention, careful strategizing, and thorough planning. • **Media must be error free.** Because there may be no instructor, all activities, exercises, triggers (which allow a user to move from one presentation element to the next), and scripts (compute language that assures interactivity or shows progression in a module) must be error free. If learners encounter problems with an application, tool, quiz or presentation and there is no one to offer immediate help, they are more likely to give up. • **Content and materials must be high quality and engaging.** Asynchronous courses rely on readings, videos, exercises, and animations rather than on direct personal interactions like discussions, or group presentations (Rapanta et al., 2020). This heavy emphasis on materials demands content and materials that are accurate, accessible, engaging, and adequate to learners' level of autonomy. They must operate within the overall learning design through appropriate scaffolding (Rapanta, et al. 2020). • **Demand a certain skill set to succeed.** Asynchronous learning can enable learners to work in a self-paced fashion, independent of time and place (van der Keylen et al., 2020 as cited in Fabriz et al., 2021). However, it requires more self-study skills, self-regulation, and strong digital skills to successfully complete learning activities. Not all learners are equipped with the skills to benefit from asynchronous courses (Berry, 2017). In one study, half of instructors reported that most of their learners had problems self-organizing their learning at home (Fabriz et al., 2021). • **Less communication and interaction with other learners.** Learning processes and educational trajectories still require socially embedded learning activities (Halkic & Arnold, 2019). When they do participate in online discussions, learners perceive such discussions as more individualistic and less cooperative than do learners in synchronous settings (Fabriz et al., 2021). • **Higher attrition rates.** Attrition rates are higher in asynchronous courses, particularly MOOCs where fewer than 10% of learners on average complete their courses (Escueta et al., 2020; Kizilcec et al., 2020; Laurillard, 2016). MOOCs in particular suffer from gender and geographic achievement gaps (Kizilcec & Halawa, 2015).

Benefits	Limitations
• **Easier to scale.** Because they do not require simultaneous or concurrent student-teacher presence, asynchronous courses, particularly self-paced ones, are easier to scale than synchronous ones (Xie et al., 2018).	• **Greater "transactional distance."** Moore's (2013) concept of transactional distance—the geographic and communications distance-related factors that must be overcome for learning to occur—is more prevalent in asynchronous courses. • **Feelings of isolation.** The lack of group-based discussions and interactions are associated with greater negative effects and a decreased sense of belonging in asynchronous courses (Peterson et al., 2018, as cited in Fabriz et al., 2021).

Summary: Asynchronous learning

Figure 5.5 presents findings on the benefits and limitations of all asynchronous courses including MOOCs.

Asynchronous and synchronous courses both offer benefits that learners value. Fabriz et al.'s 2021 study of 3,056 German university online learners reported that these learners valued both the quality of learner-content interaction (i.e., reading interactive texts, watching videos, and completing assignments), and learner-teacher interaction (i.e., providing feedback, providing summative and formative assessments, and documenting students' progress), and that both had a strong effect on satisfaction with learning and perceived learning (Fabriz et al., 2012, p. 3). Further supporting this view, Means et al. (2009) found that variations in the implementation of online learning did not significantly affect student learning outcomes. Their review of experimental and quasi-experimental studies contrasting different types of online learning practices found that online learning could be enhanced by giving learners control of their interactions with media and prompting learner reflection (Means et al., 2009, p. xvi).

Two additional findings are notable regarding asynchronous courses. First, direct, instant communication matters in all types of online learning. Though learners in asynchronous courses report their satisfaction with asynchronous communication tools (such as discussion forums or email communication), they also appreciate the possibility of direct instructor feedback in synchronous settings and are more likely to take advantage of online office hours with the instructor than are learners in synchronous courses (Berry, 2017; Fabriz et al., 2021). Nieuwoudt (2020) stresses that these types of interactions, and how students are engaged in the learning process, require far more investigation than is currently the case.

Finally, both Figures 5.4 and 5.5 emphasize the critical role of learners' personalities in their abilities to successfully engage and succeed in various online learning activities (Blau et al., 2017). Thus, distance learning programs should take into account the importance of tailoring online learning environments to the learner's personality and steering potential online learners to the right type of online learning (Blau et al., 2017). This can involve providing various options for learners to participate and interact online and attend virtual classes synchronously and/or asynchronously. It may also involve designing varied activities to provide online learners with multiple opportunities to communicate synchronously and/or asynchronously within and beyond the class and making available recordings of synchronous virtual classes that can be viewed asynchronously (Blau et al., 2017; Nieuwoudt, 2020, p. 15).

5.6.3 Bichronous Learning

As explained in Figure 5.1, bichronous learning is a learning experience that embeds both synchronous and asynchronous online elements—ideally evenly and with deliberation, though in reality this is not always the case. This section discusses examples of bichronous learning facilitated by two platforms—learning management systems and online classrooms. Web 2.0/social media tools can also be used bichronously as they allow learners to participate in live or delayed communication and sharing. However, because they play such a prominent role in teacher learning and support, they are addressed separately in the next section of this chapter.

Learning Management System

As noted previously, prior to COVID-19 pandemic school lockdowns, online learning typically took place largely within a learning management system. A learning management system (LMS), such as *Moodle*, *Canvas*, or *D2L Brightspace*, is basically an **online class** with the following attributes.

- **An administrative component.** It supports grading, reporting, student information, and typically connects to or has its own student information system (SIS).
- **A content management component.** Learning management systems store content of all types in a library or repository. For this reason, they are sometimes called, "content management systems" and they are sometimes confused with portals (an online repository of content). An LMS can connect to and embed a portal, but it is not a portal.
- **An instructional component.** LMSs come with numerous creation tools so instructors or instructional design teams can create activities that learners do either asynchronously, or synchronously in the LMS itself. These include discussion boards, chats, office hours, virtual meetings, and collaboration tools. Most LMSs also allow integration of "third-party" apps, for example, Google *Drive*, *Big Blue Button*, *Mahara, Nearpod,* or course development tools such as *H5P*.
- **An assessment component.** Instructors can build and implement multiple types of assessments within an LMS and grades are automatically uploaded into a gradebook. For closed-response tests, answers can be graded automatically. Open-ended assessments, such as essays or portfolios, can be easier to mark in an LMS through the use of rubrics and other grading supports.
- **A data component.** Learning management systems collect data based on their users' activities. These data often are used to improve the platform's performance, provide better tools, track each learner's progress, review the performance of students, and personalize the learning experience. LMSs also use analytics and early warning systems that can better alert an instructor when a learner is falling behind. These systems can make predictions about a new learner's success significantly better than predictions made with the administrative data alone (Bird et al., 2022).

Courses in learning management systems have traditionally been asynchronous and, like MOOCs, little attention was paid to their pedagogy. Yet LMSs can support bichronous learning—that is, both asynchronous learning (learners log in, read, watch videos, do assignments, take a quiz, participate in discussions) and synchronous learning (live chats, live oral and written discussions, joint product creation, Web meetings)—if the LMS has or is able to embed a Web-conferencing tool.

LMSs have a long pedigree in education. Long before "blended learning" was a thing, instructors used LMSs to host course materials for their in-person classes, hence the designation "content management system." From the mid-1990s to 2020, the majority of formal online learning for pre- and in-service teachers most likely occurred in an LMS, such as *Moodle*, or LMS-type system,

like the now defunct but highly popular *Edmodo* platform. How that learning occurred, however, is not known.

Online classrooms

Online classrooms are a pared-down and simplified form of an LMS. The most well-known online classroom is Google *Classroom*.[20] Google *Classroom* is a free Web service for schools that aims to simplify creating, distributing, and grading assignments between teachers and students. (It also is an example of "Software as a Service"). Though this is changing, Google *Classroom* is primarily used *by teachers for students*. Millions of teachers across the globe have been trained in how to use Google *Classroom* as part of instruction—but its use for other types of professional development seem limited.

Google *Classroom* consists of the following components.

- Google *Drive.* A cloud-based storage space on which the teacher creates a folder ("class") and invites students to enter with a shared link. The class is copied onto the student's Google *Drive* where it then resides. The student submits the assignment to the teacher for grading.
- Google *Calendar.* The teacher adds assignments and due dates to Google *Calendar*. These are pushed out onto the students' Google *Drive*.
- Google Apps for Education (GAFE). These are productivity applications—*Docs, Sheets, Slides, Gmail, Forms, Meet,* and the *Chrome* browser. They form a cohesive, cloud-based platform to manage student and teacher communication. Students can work on their assignments using these tools, collaborate live with classmates and the teacher, and the teacher can add comments.
- Third-party Extensions. There are hundreds of third-party (i.e., not Google) extensions designed to work within the *Chrome* browser to make GAFE more powerful and flexible—for example, rubric builders, translation tools, voice tools for feedback, and so on. These extensions can be found at the *Chrome* Web store.
- Google *Meet.* Google's Web conferencing platform is now integrated with all Google products so teachers can create a unique Google *Meet* link for each class in Google *Classroom*. The link acts as a dedicated meeting space for each class and, unlike other Web conferencing platforms, is time- and date-independent.

Despite these features, Google *Classroom* lacks several features that are found in standard learning management systems. As Google is constantly updating *Classroom*, corrections to the shortcomings listed below may be imminent.

- Reporting. Unlike an LMS, Google *Classroom* does not connect to a student information system or attendance database.
- Fixed appearance. Unlike an LMS, Google *Classroom* can be only minimally customized. All classes in Google *Classroom* essentially look the same and all assignments are stored chronologically, so students and teachers have to do a lot of scrolling to find older assignments.
- No dedicated discussion forum or chat. There are numerous workarounds for this issue, however. For example, the *Stream* feature allows for communication; teachers can create questions in documents and students can respond in real time; learners can collaborate via writing on documents in real time; and teachers can use apps such as *Jamboard* to host online discussions.
- Lack of compatibility. A course created in Google *Classroom* cannot easily be exported

[20] Google *Classroom* is often referred to as an LMS though it is not at least at the time of this guide's publication.

to an LMS (or vice versa) since, unlike an LMS, Google *Classroom* is not SCORM compliant[21] (An LMS can link to Google *Classroom* and *Drive*, however). Nor can users embed non-*Chrome* third-party extensions or software (e.g., MS *Word*) into Google *Classroom*, as one can in an LMS.

- Closed system. Google *Classroom* is not an open system and does not have a reciprocal relationship with the majority of platforms and tools. While most LMSs will incorporate Google *Drive*, within Google *Classroom* a teacher can incorporate only Google-approved tools.[22]

Google *Classroom* can, and often does, support individual online work where learners complete an assignment and turn it in for a grade. However, its real power is the functionality and ease of its applications (GAFE) and third-party extensions which make real-time collaboration and sharing seamless. Thus, Google *Classroom* is also often foundational to synchronous activities in online learning.

Since 2014, following the introduction of Chromebooks (essentially a netbook or a thin client computer), and, in particular, since the COVID-19 pandemic, Google has made a powerful one-two thrust into the world of online and blended learning. In the first few months of remote schooling in 2020, Google *Classroom* enjoyed an increase of 100 million subscribers (DeVynck & Bergen, 2020). This growth and the ubiquity of Google services has had very real ramifications for online learning. By offering its products and services for free, targeting schools, actively training teachers to be "Google Certified Educators," and through the power of its *Chrome*-based extensions, Google has created a free online ecosystem and an intergenerational loyal user base, and has defined the contours of the online learning experience in ways not yet fully comprehended (Burns, 2021). This will undoubtedly have market share implications for LMS providers as well as ramifications for the future conceptualization and organization of online learning.

Summary: Bichronous learning

This discussion of bichronous learning suggests that there is much overlap between the two segments of online learning—synchronous and asynchronous. For example, instructors in asynchronous courses may host live office hours and chats to accommodate the queries of online learners. The degree to which synchronous and asynchronous elements are integrated into an online course suggests that asynchronicity and synchronicity may be better conceptualized as points along a continuum rather than dichotomous categories. This is the conceptual underpinning of bichronous learning—a term that is new but an approach that has long attempted to blend the best, and mitigate the weakest, elements of both asynchronous and synchronous learning.

Not surprisingly, given its semantic novelty, research on the effectiveness of bichronous learning, particularly for teacher learning, is hard to come by (Confusingly, for a while "bichronous learning" was sometimes referred to as "blended learning."). Where it has been studied (McCormick, 2018; Ogbonna et al., 2019; Rockinson-Szapkiw, 2009), synchronous and asynchronous elements have been typically analyzed in isolation and contradistinction rather than as integral elements of a unified whole in which fully bichronous learning can be compared with fully synchronous or fully asynchronous learning (Fabriz et al., 2021). Thus, we know more about the parts of bichronous learning than we do the sum of its parts.

[21] SCORM or Sharable Content Object Reference Model, is a set of technical standards for eLearning software products and is the de facto industry standard for eLearning interoperability. Specifically, SCORM governs how online learning content and learning management systems (LMSs) communicate with each other. SCORM is purely a technical standard; it has nothing to do with design (SCORM.com, 2022).

[22] Read more about Google's efforts to open up *Classroom* here: https://blog.google/outreach-initiatives/education/classroom-the-anywhere-school-updates/

This difficulty is compounded by the fact that a plurality of online learning research does not mention the type of platform used. As this chapter notes, online learning is highly platform-dependent because the platform accommodates or constrains the design of learning and how instruction occurs. Apart from MOOCs, there is very little in terms of research on types of online platforms. Where literature exists, it tends to focus on the non-instructional components of an LMS (Oliveira et al., 2016). Similarly, there is almost no published research on Google *Classroom* or third-party apps as a platform for teacher learning.

There are a few exceptions. One study did look at LMSs, finding mixed results and no significant difference on student learning in an LMS (Coiro, 2014). Another study (Uzun, 2022) examined bichronous online teaching in the context of teacher education. It found that differences that existed among online instructors in their use of bichronous online teaching were dependent on academic and professional qualifications, years of experience in their fields, and their ability to use various educational technologies. It did not examine the impact of bichronous learning on student outcomes. We can infer that using design elements of both online learning approaches—synchronous and asynchronous—produces the "best of both" for learners. But such an inference, no matter how seemingly intuitive, requires a larger body of evidence-based research than currently exists.

5.6.4 Summary of Asynchronous, Bichronous and Synchronous Online Courses

This section of Chapter 5 has examined online learning through a synchronous, asynchronous, and bichronous lens and anatomized online learning through its delivery platforms—Web conferencing systems, LMSs, MOOCs, virtual classes, and two-way Web conferencing (Social media will be discussed in the next section). It concludes with an examination of online learning in its totality.

Despite the dominance of online learning as teachers' primary mode of distance education, there is little relative research on the experience of online learning for in-service or pre-service teachers. The research that does exist is typically focused on university students and the general population, hence the use here of adults and university students, respectively, as imperfect proxies for teachers and pre-service teachers. Nor is there much examination of the extent to which the effects of online professional development translate into changes in teacher knowledge and instructional practices.

Nor, surprisingly, is there a focus on learner outcomes as a result of online learning. This is particularly remarkable given that a high percentage of online programs are located in degree-granting tertiary institutions. A systemic review of online teaching and learning from 2009–2018 revealed that the largest number of studies on online learning focused on *engagement* in online learning (presence, interaction, community, and peer-to-peer interaction, as well as completion and attrition). This is followed by *learner characteristics* (self-regulation, motivation, and academic aspects related to the online learner) (Martin et al., 2020a). The least frequently researched themes were evaluation, quality assurance, the use of specific online course technologies (*Moodle*, *Blackboard*, or *WebEx*, for example), instruction, and learning outcomes (only 5% of all studies) (Martin et al., 2020a).

One way to examine the impact of online learning is to contrast it with in-person learning. Here there is some empirical evidence suggesting that online learning can be comparable to or better than in-person learning (Escueta et al., 2020; Hodges et al., 2020; Paul & Jefferson, 2019). Effect sizes from an examination of 125 experimental and quasi-experimental studies on online learning from 1990–2009, with over 20,000 participating university students, demonstrated that in 70% of the cases, online learners outperformed their in-person counterparts. Authors did not examine the differences between synchronous or

asynchronous courses, however. They concluded that online education not only is "comparable to traditional instruction, but also, subject to our criteria, can outperform traditional instruction" (Shachar & Neumann, 2010, p. 326).

Two empirical studies, both from the U.S., examined the impact of online learning for educators.The first is a 2010 meta-analysis of research on online learning from 1996 to 2009. It showed, on average, that online learners performed modestly better than those receiving face-to-face instruction (Means et al., 2009, p. xiii). Effect sizes were larger for studies in which the online instruction was collaborative or instructor-directed than in studies where online learners worked independently. The overall finding of this examination was that classes with online learning—either completely online or blended—on average produced stronger student learning outcomes than did classes with solely face-to-face instruction (.20 mean effect size) (Means et al., 2009, pp. 18, xiv). Learning outcomes for those who engaged in online learning exceeded those receiving face-to-face instruction, with an average effect size of +0.24 favoring online conditions. The authors reported that the mean difference between online and face-to-face conditions across the 51 studies was statistically significant at the $p < .01$ level (pp. 18, xiv). They also cautioned that the results may have been the result of dimensions that exceed the type of technology delivery, such as the amount of time that learners spent on task.

A second, multi-tiered impact study examined the pedagogical content knowledge and instructional practices of 118 teachers and their 1,688 students—922 in the control group and 766 in the treatment group—participating in EDC's *EdTech Leaders Online* professional development program. Two randomized controlled trials focused on mathematics instruction (5th- and 8th-grade teachers) and two on language arts instruction (4th- and 7th-grade teachers). For each trial, teachers who volunteered to participate in the study were randomly assigned to the treatment or control group. Teachers assigned to the treatment group then participated in a set of three online professional development courses, each lasting for seven weeks. Collectively, the four trials provide strong evidence that participation in a coordinated series of online courses has positive effects on teachers' *instructional practices* and content knowledge. Across all four trials, larger changes in instructional practices occurred for teachers in the treatment group. In many cases, the effect of the online courses on instructional practices was large. Across all four trials, larger changes in teacher *content knowledge* also occurred for teachers in the treatment group. In most cases, the size of the effect was medium or large. Each trial also provided evidence that teacher participation in the online courses also had positive effects on those teachers' students (Dash et al., 2014:93; O'Dwyer et al., 2010: 93).

Online learning is complex. Because of this complexity, online learning, perhaps more than other mode of distance education, is subject to numerous threats to its quality and effectiveness. The expertise, skill, and responsiveness of instructors all can vary, as can levels of in-person support for learners. The design of learning, the type of instructional activities, content format, and the synchronicity, asynchronicity, and bichronicity may all influence learning outcomes. As *Chapter 14: Preparing Distance Learners* will discuss, success in online learning is driven by a series of discrete and interconnected personal, learning-related, and course- and program-related attributes. Further research is still needed to disentangle these variables and determine their impact on learning online (Escueta et al., 2020).

5.7 Web 2.0

The World Wide Web, like distance education itself, is referenced according to "generations" and is classified by two retronyms. Web 1.0 is the first-generation, more "established" World Wide Web. Web 2.0, the second-generation Web, is a broad term that refers to the World Wide Web as a platform where users can not only access but

also create and share content (the "read-write" Web). That term has evolved into and is used interchangeably with the term "social media."

Social media is more accurately an umbrella term referring to interactive technologies that allow users to create and share information, interests, and ideas. Social media includes blogs, wikis, photo sharing sites, geo-location services, and social bookmarking sites. At the heart of social media is "social networking"—the ability to connect and collaborate with networks of individuals or groups, both synchronously and asynchronously.

This section discusses Web 2.0 tools, with an emphasis on social media and social networking platforms. Though far from a perfect distinction, this chapter distinguishes between social networking platforms, which often are used for one-to-many communication, versus messaging apps, which often are used for one-to-one communication (although *WhatsApp* operates both as a social media tool and messaging app). Since messaging apps, such as *WhatsApp* and *Signal*, are typically accessed via phones, they are examined in the next chapter on mobile learning.

5.7.1 Web 2.0 Tools

It is much easier to use some kind of eLearning platform (an LMS or Google *Classroom*) with a Web-conferencing system. But distance education programs can still support online learning *without* these tools.

In contrast to the traditional World Wide Web (Web 1.0)—a closed system where content creation and consumption are typically conducted by two separate set of actors (producers and consumers)—Web 2.0 is an open, dynamic system where users are both producers and consumers of information, creating and sharing their own personalized content. Typically then, Web 2.0 tools are characterized by three Cs—contributing, creating, and collaborating (Cormode & Krishnamurthy, 2008).

Web 2.0 suffers from the same lexical confusion as many technology terms. First of all, this term, "Web 2.0" is rarely used anymore. In part, this is because Web 2.0 has become so successful that it has transformed software design. Over the years, thanks to Web 2.0 technologies and increased Internet access, software has shifted from a program that is installed on a computer to a service residing in the cloud, hence the concept of "software as a service" (SaaS), another term often used instead of "Web 2.0." In the SaaS model, software is centrally licensed on a monthly or annual subscription basis and stored on Internet-based servers. It thus can be accessed on any device that is connected to the Internet. In exchange for an ongoing fee, vendors take care of updates, new information, upgrades, and other processes associated with this content or software.

Web 2.0 platforms are extraordinarily popular within education for both for student and teacher learning. They allow learners to do many—though not all—of the same things they do in an LMS at a much lower cost. For example, learners can participate in asynchronous or synchronous discussions in *Parlay* or *Kialo*; take a quiz in *Kahoot*; collect ideas and vote on them using *Tricider*; share presentations through *Slideshare*; create interactive, annotated texts and videos in *Actively Learn*; check for student understanding with *Go Formative;* and use free assessment and feedback tools such as *Floop*. Distance education designers can use *Nearpod, PearDeck,* or *EdPuzzle* to create interactive multimedia activities for teachers as part of online or blended courses.[23] Their narrower set of features often means that Web 2.0 platforms don't have the learning curve of an open-source LMS or MOOC platform or the expense of a commercial LMS. Many of these

[23] Two sites for examining and accessing Web 2.0/SaaS tools are at https://blogs.umass.edu/onlinetools/. For examples of stand-alone tools, visit https://www.toptools4learning.com/.

applications can be integrated into an LMS, Google *Classroom*, a MOOC platform, or a Web-conferencing system.

The danger, as always, is that these tools are monetized (in the case of the free ones); cannibalized by edtech rivals (in the case of the popular ones); or bought by an educational technology giant who raises fees associated with their use or discontinues their use. These disruptions, which are not infrequent, often mean that distance programs that rely on Web 2.0 platforms can lose data, content, activities, or in some cases, their whole program (Mollenkamp, 2022).

5.7.2 Social Media

Social media is a subset of Web 2.0 tools, but the two terms often are used interchangeably. Social media's growth has been both expansive and dramatic. As of December 2022, there were 4.7 billion social media users across the globe, and these users are spending more time on social media sites—an average of 147 minutes per day in 2022 versus 90 minutes per day in 2012 (Statista, 2022b; Statista, 2022a). *TikTok*, a video sharing site, grew to 1 billion users in less than five years, far faster than the growth of any other technology in memory. In just three years (2018–2021), the average number of hours Americans spent on *TikTok* grew by 67% (Harwell, 2022).

Like the population at large, teachers across the globe have enthusiastically embraced social media in both the Global North and Global South. Numerous teachers create blogs; download and upload learning resources through *Canvas Commons;* communicate with other teachers through *Facebook*; analyze classroom video episodes with colleagues via *VoiceThread*; share ideas for teaching and participate in classes via *TikTok*; connect with other teachers, stay current on educational trends, and look for education-related job postings on *LinkedIn*; use Google *Docs* to create collaborative lesson plans and classroom materials; design or participate in a course in *Wikiversity*, a free, open, Web-based university; and create a social network with students via *Twiducate*. Teachers with particular physical needs may use accessible social media Web sites such as *Accessible YouTube, Easy Chirp,*[24] and *You Describe* to access content and information.

Figure 5.6 outlines some of the more popular types of social media tools for teaching and learning.

Whether as part of a formal face-to-face or distance learning approach, different social media tools have different affordances for teacher learning (Jordan & Mitchell, 2020). For this reason, they have increasingly been integrated into, supplemented, and evolved into their own form of teacher professional development—as self-study tools, as part of professional learning networks with other educators, or as distance learning platforms in their own right.

5.7.3 Benefits of Web 2.0 Tools for Teacher Education

Web 2.0 tools, including social media and social networking sites, have proven to be popular vehicles for teacher learning, offering many benefits as summarized below.

Web 2.0 tools can deepen teachers' professional knowledge

The duality of Web 2.0 tools—the fact that they can serve as both authoring and communication tools—can help teachers feel comfortable both with creating information and with communicating and collaborating around that information (Burns & Bodrogini, 2011). Studies from Bhutan, Pakistan, Kenya, and Indonesia show that simple-to-use social media applications provide teachers and teacher educators with opportunities to access, develop, and share free, high-quality content, encouraging them to be creators, not simply users, of content that they can use as part of teaching (Burns & Bodrogini, 2011; Impedovo et al., 2019). *YouTube*, where teachers

[24] As of this writing, this site is still in use but no longer maintained.

Figure 5.6
Social Media Types

Social Media Type	Description	Examples
Blog ("Weblog")	• Typically these are free websites that allow subscribed users to read, comment on existing ideas, and share new ideas. • Authors and readers also can communicate with each other via the blog. • Blogs can be part of an organization, a stand-alone site, or run by an individual or groups of individuals. • Blogging is a style of writing characterized by short articles and more informal language and can be subjective or personal.	• *Edutopia* • *eLearning Industry* • *La Clase de Miren* • *Un Monde Meilleur*
Location-based services	• Available through the Global Positioning Service (GPS) function of mobile devices, these services or "applications" can be downloaded to smart phones or tablets. • Some, but not all, pinpoint a user's geographic position as well as the position of others and allow users to view, edit, and use geographical data from anywhere on Earth.	• *Foursquare* • Google *Earth* • Google *Maps* • *Open Street Map* • *Ushahidi*
Media sharing	• These sites allow users to post media (e.g., images and video), tag media, have conversations around media, and form interest groups. These are also often called "peer-to-peer" or P2P sites.	• Instagram • Flickr • TikTok
Microblogging	• These are sites that use simple composition and publishing techniques so users can interact and communicate in short messages. • In *Twitter*, users "tweet" and "retweet" messages and are limited to 280 characters. • In *Mastodon*, "tweets" are "toots" and "retweets" are "boosts." They have a 500-character limit.	• *CounterSocial* • *Mastodon* • *Sina Weibo* • *Telegram* • *TweetEmote* • *Twitter*
Social bookmarking	• On social bookmarking sites, users annotate websites through "tags," share Web-based resources, and communicate and form communities around such resources.	• *Diigo* • *Google Keep* • *Pearltrees* • *Symbaloo*
Social networking	• These are online platforms in which people construct social relationships with others based on similar personal or career content, interests, activities, backgrounds, or real-life connections. • They are increasingly specialized. For example, *Natterhub* is designed to help teachers instruct children to use social media ethically.	• Facebook • *Horizon* (VR social network for *Meta Quest* users) • *LinkedIn* • *Natterhub*
Wikis	• Wikis are akin to a group journals. • They allow multiple users to collaboratively manage, create, and edit webpages within a Web browser.	• *Wikidata* • *Wikimedia* • *Wikipedia*

can watch examples of reading instruction, differentiated learning, or grouping techniques, may very well be the world's most popular teacher professional development platform (Burns, in press). (Creation of digital content will be discussed in Chapter 12.)

These professional benefits of social media extend beyond simple content development, sharing, and curating. Social networks can play a central role in the introduction of innovative pedagogical practices and better understanding of content-related pedagogical practices (Duncan-Howell, 2010; Jordan & Mitchell, 2020). For instance, in one study in Bhutan, 92% of teachers surveyed reported that their social media use positively impacted their professional practice, helping them learn new teaching ideas and stay current on innovative approaches (Impedovo et al., 2019). In the same study, Pakistani teachers expressed similar sentiments. A small study of Kenyan teachers' *Facebook* use showed that teachers spent a significant amount of time within this platform focusing on curriculum and how best to teach it (Bett & Makewa, 2020).

Web 2.0 tools offer highly personalized professional development to teachers

The structure and interface of Web 2.0 platforms, particularly social networking platforms, portend continued transformation of distance learning from the walled gardens of LMSs and Web conferencing systems to more organic, teacher-driven communities of practice (Pérez Sánchez et al., 2017). Through social media, teachers engage with customizable content and interact with their own learning team, sharing experiences and studying various components of teaching based on their own differentiated needs (Burns, in press; Impedovo et al., 2019). The very architecture of social networking sites—their use of predictive algorithms that make assumptions about users' potential interests—allows for greater personalization. Teachers receive customized feeds in a technically simpler, less uniform, and more dynamic way and can then tailor, annotate and reshare this content.

Social networking sites, in particular, can bring resources and expertise to classrooms and teachers who may lack both. This is particularly valuable for young teachers wrestling with their first year of teaching or for those who may feel ill-equipped to teach a particular content area, as well as for more experienced teachers struggling with the conceptual and logistical burdens of implementing an innovation (e.g., computers) in their classroom.

Social media can help teachers establish and nurture strong professional relationships across distances

The real value of social media for teacher education is that it allows teachers to create, join, and expand personal learning networks (PLNs). PLNs facilitated by social media offer two valuable supports for professional learning. First, they can complement and enhance face-to-face relationships, deepening existing relationships or "bonding ties" (Gittell & Vidal, 1998). Bonding ties often form the basis of communities of practice, which in turn are instrumental in helping schools and teachers institutionalize new ideas and practice. They also can allow teachers to benefit from "the strength of weak ties" (Granovetter, 1973). Novel or new information flows to individuals through weak, versus strong, ties. Since we move in the same circles as our peers, we tend to know the same information as they do. But by interacting with new peers, teachers can acquire new knowledge and skills from people with whom they would not normally come into contact. This in turn can ostensibly facilitate integration of new perspectives and ideas into their existing practice, which can ideally improve instructional quality (Bett & Makewa, 2020; Impedovo et al., 2019). These ties are even more crucial when teacher groups are geographically dispersed, as they may otherwise have no opportunity to learn from others (Impedovo et al., 2019; Jordan & Mitchell, 2020).

The development of professional and personal relationships with other teachers can begin to lay the foundation for communities of practice

The above networked relationships are one of the key factors influencing the effective functioning of small groups, particularly when such groups are engaged in knowledge-intensive work (Yuan & Gay, 2006). But to instantiate and institutionalize changes, teachers must be part of a community of practice. As will be discussed in *Chapter 15: Building Community,* technically simple, multimodal social media applications, utilized as part of a larger collective purpose, can reduce isolation, make learning and experimentation less risky, and promote mutuality and reciprocity—all of which create the foundation for a community of practice.

By their very design, social media platforms epitomize many of the characteristics associated with optimal learning environments

For instance, social media sites such as *Facebook* embed many of the qualities of a good "official" education technology in their reflective elements, mechanisms for peer feedback, and compatibility with the social context of learning. The conversational, collaborative, and communal qualities of social media tools complement much of what we know to be "good models of learning, in that they are collaborative and encourage active participatory roles for users" (Maloney, 2007, p. 26). Interviews with teachers from countries as diverse and widespread as Bhutan, Pakistan, Indonesia, Brazil, Honduras, Ecuador, Zambia, Philippines, the U.S., Ireland, and Federated States of Micronesia suggest that teachers use a variety of social media technologies such as *Instagram, YouTube*, and blogs because of their accessibility, their networked nature, and ease of use (Burns, in press; Burns & Bodrogini, 2011; Impedovo et al., 2019). Thus, for many teachers, social media serves as a public square where they can share ideas, experiences, and opinions.

Social media can promote informal learning

Informal learning is learning that is educationally beneficial but not required by the institution and occurs outside the regular school day or beyond formal teacher in-service sessions or classes. Whereas formal learning is typically institutionally sponsored, school-based and structured informal learning "is not typically classroom based or highly structured, and control of learning rests primarily in the hands of the learner" (Marsick & Watkins, 1990, p. 12). Informal learning can accrue from opportunities offered by Web 2.0 applications for learners to engage and collaborate in socially connected networks of peers and online services, allowing learners to take control of their own experiential learning in non-school spaces and at times and with colleagues of their choosing (Selwyn, 2007).

Social media can diversify and broaden traditional online structures of communication in ways that non-social media applications may not

Because of the hierarchical and threaded design of learning management systems, the dominant pattern of communication in online learning discussion forums tends to be a "hub-and-spoke"–based structure of Instructor (hub)—Learners (spoke), with much or most of the discussion emanating to and from the instructor. Discourse analysis from an online course in Indonesia that incorporated social media revealed a more networked communication pattern when educators used social media versus when they used the discussion forum in their LMS, *Moodle* (Burns & Bodrogini, 2011). Similar communication structures were found in network density analysis of knowledge exchanges among 78 Chinese pre-service teachers using *WeChat* versus the *Moodle* discussion board. While *Moodle* and *WeChat* both facilitated collaborative learning, researchers noted higher density communication on *WeChat*, suggesting that it might have "a special affordance for social interaction" (Sun et al., 2018, p. 257). Findings such as these may help online learning programs make informed decisions about which

communication tools to use, and for what purposes, as part of formal online learning (Sun, et al., 2018).

5.7.4 Limitations of Web 2.0 Tools for Teacher Education

Social media has proved itself to be a promising teacher education tool, fostering cooperation and collaboration, promoting real-world uses of technology, and broadening teachers' exposure to people, places, and resources. But many of the attributes mentioned above also make social media a particularly troubling technology. For example, its predictive and personalized nature and flat, fast structure accelerate and augment the proliferation of rampant misinformation and disinformation ("fake news") as will be discussed in greater detail in the next chapter.

Social media has other drawbacks: its documented threats to mental health (primarily for adolescent users); the commodification of formerly free sites; difficulty in safeguarding intellectual property; the competition and transformation of social media into full-fledged media companies that track users' data (often without consent); its constant froth of hate speech, trolling, rudeness, and general snarkiness; and violation of students' rights by teachers who often film and upload classroom episodes involving students without student or parental consent (Anderson, 2017; Burns & Bodrogini, 2011; Tait, 2022). Further, social media sites, particularly video sharing sites such as *YouTube, TikTok*, and *Reels,* use monopolistic practices. By deliberately designing video data portability to be so difficult, they essentially force video viewers and creators to watch and share videos on their platforms alone (Arnao, 2022).

Besides the above threats, Web 2.0 applications must be carefully selected and employed as either part of distance instruction or as a carefully crafted stand-alone professional development mode, and a number of design issues should be considered. First, the utility of Web 2.0 applications still depends on *human* networks—the key is a knowledgeable body of peers committed to sharing ideas and experiences. Care must be taken to design activities within Web 2.0 applications that are truly interactive, collaborative, and that encompass a network of users. Next, the use of social media should occur within a specific pedagogical framework with activity structures to better help teachers capitalize on the heterogeneity of social media; should be developed according to tenets of learner-centered instruction; and should present a set of shared norms to guide all interactions and transactions (Burns & Bodrogini, 2011, p. 188).

Finally, online course designers must help learners understand the importance of constructing knowledge and the importance of being members of an active online community where they have continuous opportunities for communication and collaboration. Teachers need to understand that online discussions and shared practice are the ties that bind a collection of individuals into a collaborative community, as well as how and why shared interactions enhance and deepen learning (Burns & Bodrogini, 2011, pp. 188–189). Often, education-related Web 2.0 sites have no evidence of interaction, preserve the broadcast nature of Web 1.0 applications by placing lots of text on a site, and fail to encourage feedback or conversation. As a result, these sites have a minimal number of users and limited potential as a PLN.

Social media and its use as a community building tool will be discussed in greater detail in Chapter 15.

5.8 Considerations: Online Learning for Distance Education

This chapter has discussed blended learning, formal online learning (i.e., courses) and social media—three forms of online learning that are rapidly evolving both technically and educationally. Despite its popularity, however, online learning writ large is under-researched, and its requisites still poorly understood by many distance education systems wishing to employ it. Therefore, as its enumerated benefits and limitations suggest, like many technologies, online learning has been both a success and

a failure as a professional development and teacher training option. This section concludes with final considerations about online learning.

5.8.1 Benefits of Online Learning

Online learning can function as a replacement for face-to-face instruction, particularly in cases where the latter is too costly or is logistically impossible to conduct successfully

The viability of online learning is often determined by its comparison to other distance technologies. Yet one of the most fundamental, but rarely asked, questions about online learning is whether or not it increases access to education for those who face barriers to pursuing an in-person degree. In many parts of the globe—for example, in parts of Sub-Saharan Africa—the answer is no because of severe infrastructural challenges. But in other parts of the globe, as Figure 5.7 illustrates, the answer is affirmative. In such locations, online learning has proved to be a "cost-effective intervention when too few learners are situated in a particular geographic locale to warrant an on-site instructor" (Means et al., 2009, p. 3).

As Figure 5.7 discusses, without online learning, access to learning would be impossible in many locations across the globe, such as remote communities with sparse populations but telecommunications infrastructure as in Arctic communities, Inuit and First Nations communities in Canada, or rural and Native American communities in the United States.

Online learning can enhance the learning experience

As an enhancement activity, online learning should produce outcomes that are not simply equivalent but measurably *superior* to those resulting from face-to-face instruction alone (Means et al., 2009). If this improvement occurs, online learning as an enhancement may be worth the additional time and resources. If not, it may be a waste of time and money since its addition does not improve learning outcomes.

Figure 5.7
The Case for Online Learning in Greenland

Arctic communities have long faced challenges with remote learning—but not the kind associated with COVID-19. Rather, it is in-person learning at the secondary level that is often too remote to access. This is true, for example, in Greenland, a self-governing region within the Kingdom of Denmark and the world's largest island. With a total population of 56,000 people, this mostly ice-covered island's population density is the lowest in the world (Government of Greenland, 2019).

While in-person primary-school access is available in most communities, the situation changes upon completion of primary school. Students can continue their education at a junior secondary school—a "continuation school"—but most schools are in the main population centers or in Denmark. And if students want to go to upper secondary school, they have to move away from their families and live in one of the four towns with a high school. Consequently, over half of Greenland's population does not progress beyond lower secondary school and 60% of its 18- to 25-year-olds do not complete high school or vocational education. In other Nordic countries, the latter rate is less than 25% (Government of Greenland, 2019, p. 14).

Enter online learning. Ninety-two percent of island residents now have access to 4G networks suitable for streaming video and synchronous virtual learning. Through online classes, secondary students can live at home as they continue their education. The government of Greenland has partnered with Danish foundations to bring quality online education, via tablets, to primary schools (the Kivitsisa project) and eventually to develop online classes.

Developing an online secondary education program will pose various challenges in terms of getting devices to students, teacher training, and the development of specialized multimedia content in Greenlandic (Conyers, 2020). But it offers hope that education will not involve separation from one's family, community, and culture while learning. Learning *online* can actually ensure and preserve vital in-person community ties.

Part of this enhancement is grounded in choice. Online education can offer teachers greater choices in learning options (Escueta et al., 2020). With in-person learning, teachers are constrained by travel or driving to a nearby university. In contrast, online learning offers learners access to more programs, across more universities, locally, nationally, or internationally—and with superior learning outcomes in many cases (Dash et al., 2014; Means et al., 2009; O'Dwyer et al., 2010; Paul & Jefferson, 2019).

Online learning provides access to continuous quality learning

Teachers across the globe see the value of high-quality professional development and want ongoing professional learning that meets certain conditions (Burns, in press). For example, 91% of U.S. teachers in one survey reported their desire for professional learning focused on a teacher's specific, unique needs, and 82% want more frequent professional development (Kuykendall, 2022).

Online learning can provide teachers with this kind of targeted, differentiated, and more frequent "anytime, anyplace" access to sustained and ongoing learning as well as to ongoing access to follow-up support to help teachers implement innovations in their classrooms. This access is particularly valuable for traditionally underserved groups and for teachers in remote geographical areas, where face-to-face professional development would be impossible (Escueta et al., 2020).

Above all, online education eliminates two of the biggest factors influencing the quality of education. The first is a teacher's geographic location (Chaney, 2001, as cited in Berry, 2017, p. 32). Second, teachers (like students) often suffer from instruction and instructional providers characterized by variable degrees of quality. As with Interactive audio instruction and instructional television, online learning, particularly via self-paced or collaborative courses, can standardize the quality of instruction that teachers receive (Berry, 2017).

They key measure here, however, is *equivalence:* If learner outcomes are the same whether a course is taken online or face-to-face, then online instruction is considered successful (Means et al., 2009).

Yet as important as this is, for many current and future teachers with no other options for professional learning, online learning's ability to increase *access* to learning may justify its use regardless of its outcomes or the other issues associated with it.

Online learning is convenient

Throughout the course of their careers, teachers will, at some point, require continuing education for renewing licensure, meeting continuing education requirements, gaining promotions, or upgrading their skills. Many of these teachers also will need learning opportunities that are flexible so they can balance professional and family-related obligations and keep generating an income as they study (Hoxby, 2017; Paul & Jefferson, 2017).

All types of online learning—synchronous, asynchronous, and bichronous—allow teachers to remain in their homes, schools or communities while studying, thus eliminating the need to travel to professional development (Nieuwoudt, 2020). It provides the type of flexible access to experts and to archival resources that fiscal and logistical constraints would otherwise limit. Even within cohort-based online courses, teachers can complete parts of assignments (such as watching a video, reading, and individual learning activities) or participate in micro-credentialled classes at home, according to their own schedules. This "any time, any place, any pace, any amount" learning is particularly advantageous for teachers in rural areas but is beneficial for all teacher learners because it increases access to different types of continuous learning and control over that learning.

Online learning also can address growing demands from learners for short, just-in-time learning modules that fit an immediate need. Learners who successfully complete such modules

could receive "badges" or micro-credentials, with the possibility of credit transferred at a later time into a more formal program, such as a graduate degree. This has begun in Canada and in Singapore, where governments have introduced training and learning tax credits for ongoing education. Thus, such short courses, whether taken alone or "stacked" to form a certificate or diploma, may become an increasingly common feature of continuous education (Contact North | Contact Nord, 2020, p. 7).

Online learning offers multichannel learning

Online learning blends all distance learning modes, such as print, multimedia, audio, and video, with the real-time communication and collaboration attributes of the Internet. It provides the opportunity for more one-on-one interactions between learners and instructors than may be the case in other forms of distance education or even in large in-person courses. Thus, it is potentially the most diverse and multimodal form of teacher distance education, and as such has the ability to target more learning preferences more successfully than any other mode of distance education. Along with mobile learning, online learning represents the only form of distance education that can offer access to such a wide range of resources, experiences, and live human expertise, making possible video-enabled real-time communication and collaboration with peers across the globe.

Asynchronous online learning benefits learners who are shy, quiet, or reticent to participate in live, synchronous, or in-person discussions. In asynchronous discussions, learners can take time to compose their thoughts and ideas and have time to reflect on how they want to respond to a question or discussion prompt. Synchronous courses can benefit those learners who are more gregarious, social, or prefer working with colleagues. They can use web conferencing platforms to facilitate live discussions and collaboration. And bichronous learning helps learners who want to balance the efficiency of completing assignments alone with the support and collegiality of working with other online colleagues.

Online learning is popular with teachers

Popularity is an attribute that should not be discounted. Professional development is often a tough sell to teachers, for a variety of reasons. Where online learning is offered, it is extremely popular, as seen by the increase in its supply and demand. Motivation is an important ingredient in willingness to engage in and complete formal learning opportunities. Teachers across the globe appreciate the convenience, flexibility, and customizable nature of online learning (Burns, in press). In South Korea, where the vast majority of professional development is offered online, a survey of 380,000 teachers who took in-service online courses found that they generally praised the high quality of online offerings (Latchem & Jung, 2010). In the U.S., 71% of teachers expressed an interest in online, on-demand professional learning (Kuykendall, 2022).

Through Web-based video, webcasts, webinars, and virtual classes, teachers can observe various instructional styles in classrooms that are both similar to and different from their own. Online professional development can provide access to experts, experiences, colleagues, tools, and resources that would otherwise be impossible without the Internet. Teachers can access a far greater variety of professional development, often free of charge, from multiple sources via the Internet. They can choose alternative interpretations, areas of interest, and even sources of accreditation. Internet educational portals, communities of practice, blogs, educational websites—and perhaps above all, *YouTube*—can provide teachers with access to a broad array of ideas, teaching and learning resources, and ongoing, self-paced, personalized, just-in-time professional development. No other distance mode offers such diversity.

5.8.2 Limitations of Online Learning

Online learning is growing at a rapid pace (Kizilcec et al., 2017). As a result, boosters of online learning claim that it has made learning more accessible, affordable, and offers the same quality as in-person learning—claims that would be impressive

if they were entirely accurate. In fact, despite the many benefits of online learning, its results are more complex and, in many cases, sobering. While online learning offers numerous benefits to teachers, it also suffers from real limitations that undermine its quality, utility, and *raison d'être* as a vehicle for teacher education.

Online learning often suffers from poor quality and a lack of quality assurance

Online learning still struggles not just with perceptions of low quality but with actual low quality (Burns, 2020a; Global Education Monitoring Report Team, 2022; Hoxby, 2017). This is indeed ironic since, as Section II of this guide makes clear, there are standards for almost every element of online learning—design, content, instruction, coaching, and professional development, as well as quality assurance frameworks.[25] Yet issues with quality are pervasive. In Botswana, for example, difficulties in regulating the large number of online programs offered by non-state institutions have resulted in numerous unaccredited and substandard teacher education programs (Global Education Monitoring Report Team, 2022). While Means et al.'s (2009) meta-analysis of online learning shows that learners participating in classes with online learning do better than those in exclusively in-person programs, those effects are "modest," making it harder to advocate for the measurable superiority of online learning. Thus, as will be emphasized in Section II of this guide, online courses are not *ipso facto* high quality or interactive—they must be made so.

Hoxby (2017) notes that most adult online learning programs are "nonselective"—they enroll any student who has completed the previous level of education, such as a high school diploma or General Education Development (GED) certificate in the case of university undergraduates. While this is key to the success of open and distance learning, it also is a design flaw that shapes many of the weaknesses of online learning.

In the United States, virtual schools (i.e., online schools), which provide a partially or fully online education to primary- and secondary-age students and often claim to provide a superior education to that offered in public schools, have not produced better student outcomes compared to brick-and-mortar schools. In fact, the opposite is true: Many full-time virtual schools have produced measurably worse outcomes (Molnar et al., 2021). Horn (2021) argues that such determinations are misleading and inaccurate since virtual schools educate harder-to-teach and more nontraditional learners than do in-person programs, and that the measures used to assess their quality are ill-fitting. (Virtual schools are discussed in greater detail in Chapter 13.)

The financial benefits of online learning are often overstated

Arguments in favor of online learning often cite its cost effectiveness, noting that over time it may be less expensive than traditional teacher training and that it reduces marginal costs associated with teaching more learners (Escueta et al., 2020). Because online degree programs are typically less expensive than in-person ones,[26] this should, the

[25] Online learning providers have a plethora of models of standards from which to draw to ensure that their courses meet minimal quality standards. For example, the Philippines, Singapore, Sri Lanka, Pakistan, Nepal, Vietnam, Myanmar, Thailand, and Qatar draw in varying degrees from UNESCO's ICT Teacher Competency Framework. All 50 U.S. states follow the International Society for Technology in Education (ISTE) technology standards, which specifically reference online and blended learning. ISTE and Learning Forward offer standards for coaching. South Africa's Professional Development Framework for Digital Learning is exemplary in terms of discussing in depth how technology can support high-quality instruction. Pakistan developed national standards in 2016 to accredit distance teacher education programs and thus increase regulatory oversight over them (Global Education Monitoring Report Team, 2022). Within this guide alone, Chapter 8 (Figure 8.2) provides examples of national teaching standards and Chapter 9 (Figure 9.1) of teacher professional development standards. Chapter 11, which focuses on instructional design, references the Association for Educational Communications and Technology checklist for multimedia and digital content as well as the National Standards for Quality Online Learning for online course design. Chapter 13 (Figure 13.3) lists standards for online instruction. Finally, Chapter 19 outlines numerous quality assurance frameworks for online programs.

[26] Part of this low cost relative to in-person programs is because there is no campus, no learner services, no real teaching staff—just technical staff and a financial person (Hoxby, 2017).

argument goes, result in higher private and public return on investment (ROI) for both individual learners and governments that provide loans and grants for those obtaining an online degree (Hoxby, 2017).

The reality is more complex. As Chapter 11 will discuss, though online learning is not the most expensive form of distance education, an online learning system is expensive to build. Further, not all forms of online learning can add learners at low- or no marginal cost—this is true only for *asynchronous self-paced* online courses that lack an instructor. One more learner in a synchronous, cohort-based course makes more work for an online instructor and involves more cost for a program.

At the postsecondary level in the United States, students in online programs face significant disadvantages. Data from the National Postsecondary Student Aid Study's 2010/2011 representative survey indicate that online learners are "older, have lower levels of parental education, are more likely to be single parents themselves, and are more likely to be working full-time while enrolled in school than other (university) students" (Deming et al. 2016, as cited in Escueta et al., 2020, p. 928). (Though these are generally university students, they also may include those obtaining pre-service teaching degrees.) These inherent learner-related characteristics and the inherent demands of learning online mean that online learners have far higher rates of attrition than is true for in-person learners.[27] This attrition undermines arguments about the cost-effectiveness of online learning.

It also undermines arguments on online learning's Return on Investment (ROI)—essentially the net profit or loss of an investment by its cost, expressed as a ratio. In terms of its return on investment, Hoxby (2017), using data from U.S. Internal Revenue Service and National Center for Education Statistics Integrated Postsecondary Education Data System (IPEDS), analyzed data from nearly every person who "engaged substantially in online postsecondary education" in the United States between 1999 and 2011 (p. 443).

Figure 5.8 highlights some of the key findings of her longitudinal study. As these data show, the ROI of online postsecondary education is modest at best. Online learning is *not* substantially less expensive for society than comparably selective in-person education. Learners themselves pay more for online education than for in-person education, even though the resources devoted to their instruction are lower. While online enrollment does usually raise learners' future earnings, it is almost never by an amount that covers the social cost of their education. This failure to cover social costs is important for federal taxpayers who, apart from the learners themselves, are the main funders of online education. The failure implies that federal income tax revenues associated with future increased earnings could not come close to repaying current taxpayers (Hoxby, 2017, pp. 453–454).

Most online learners' earnings do not rise by an amount that covers even their private costs—the tuition and fees that they themselves, as opposed to governments, pay. As Figure 5.8 indicates, this suggests that former online learners will struggle to repay their federal loans. As a result, online education is controversial among U.S. federal policymakers for three reasons.

- The sector's learners generate a disproportionate share of defaults and repayment issues with student loans.
- They also account for a disproportionate share of tax expenditures on tuition and fees.
- In federal undercover investigations and audits, online postsecondary institutions have been disproportionately found to "[engage] in deceptive marketing, fraud, academic dishonesty, low course-grading standards,

[27] Attrition will be explored at length in *Chapter 14: Preparing Distance Learners.*

and other violations of education regulation" (Hoxby, 2017, p. 402).

It is important to bear in mind that the above analysis, as well as data presented in Figure 5.8, are primarily post-secondary online programs for adults in the United States, *not* online courses for teachers. Still, findings should temper some of the boosterism around the preeminence of online versus in-person education and prompt introspection among many online programs.

Online learning is highly dependent on robust infrastructure

The Internet presents a rich array of offerings: real-time communication and collaboration capabilities; the ability to provide audio- and video-based examples of good instruction; complex, content-based simulations and multimedia; and capacity for interactivity with content, people, and experiences. To take full advantage of these, teachers need access, near or at their places of employment, to well-functioning computers and high-speed Internet capable of quickly transmitting audio, video, and multimedia files. Yet telecommunications monopolies that charge exorbitantly high rates for Internet access, uneven electrical supply, low bandwidth, and poorly functioning and maintained computers found in many countries or regions mean that teachers have no access to online learning or that distance education institutions have no recourse but to place lots of low-bandwidth text on a website. In this example of "old wine in new skins," online learning devolves into an expensive print-based delivery system.

These infrastructure limitations—to hardware, bandwidth, and electricity—arguably impact online learning more than any other mode of distance education. Print, audio, visually-based, and mobile learning distance initiatives experience far fewer struggles connecting to learners vis-à-vis online learning.

Online learning has high entry barriers

As will be discussed in *Chapter 14: Preparing Distance Learners*, online learning demands much of those who engage with it. Instructors and learners require a range of skills to be successful in an online environment. Online learning demands a diverse range of common "literacies" among instructors and teacher-learners—traditional literacies, such as reading and writing; digital literacies, such as technology skills,

Figure 5.8
Return on Investment (ROI) in online post-secondary education in the United States (based on Hoxby, 2017)

Online postsecondary education is subsidized by taxpayers. On average, the social cost of a year of exclusively online postsecondary school is $8,325, of which $3,620 (43.5%) is funded by federal taxpayers through grants and tax expenditures (Hoxby, 2017, p. 424).

Online learners rarely fully repay loans. Online learners are overrepresented among those who default on U.S. federal student loans or enter income-based repayment schemes. They are thus less likely to end up repaying what they owe nor do they typically repay current federal taxpayers through higher future federal income tax payments (Hoxby, 2017, pp. 453, 425).

ROI for society is low while social costs are high. As a result of the previous point, social ROIs are below 1 for exclusively online education (An ROI of 1 means both the investment and return are equal). Even if online graduates repay 50% of their loans, federal taxpayers will have funded 69% of the cost of their education, with little recoupment through higher future taxes (Hoxby, 2017, p. 425).

Private ROI is higher, but still not great. Not surprisingly, private ROIs are uniformly better than social ROIs, since private costs, which are in the denominator of the ROI equation, are uniformly smaller than social costs. Yet, when they enroll in online programs, people lose rather than gain earnings (Hoxby, 2017).

Mainly online graduate education has somewhat better ROIs. They are "far below 1 or negative for two- and three-calendar-year episodes, hover around 1 for four-year episodes, and are always well above 1 for the comparatively rare five-year episodes" (Hoxby, 2017, p. 443).

production skills, and retrieval skills; information literacies, such as critical thinking skills, analysis skills, and evaluating sources. These literacy requirements may make it a *poor* choice of distance education in many cases and in many parts of the globe.

Online instruction involves teaching skills that are unique to a virtual environment. As will be discussed in *Chapter 13: Preparing Distance Instructors*, online instructors specifically need to be able to facilitate online discussions that are rich and meaningful, respond in a timely manner to teachers, and model active learning strategies. Most online programs fail to prepare their instructors to teach online, thus resulting in what is generally perceived as low-quality online instruction (Bawa, 2016; Berry, 2017; Garrett et al., 2021; Lowenthal et al., 2018).

Further, as *Chapter 14: Preparing Distance Learners*, contends, online learning requires strong social, emotional, and behavioral skills of learners—a certain level of readiness as autonomous, self-regulated, independent learners with strong time-management and organizational skills, who understand the importance of being an active member of an online community. Its lack of boundedness to time and place means that these e-readiness skills are absolutely crucial. But often these are the very skills absent among teacher-learners who have been acculturated (as students and as teachers) in education systems that emphasize hierarchy, individual achievement, competition, obedience, passivity, conformity, and structure. The flexibility required and the paucity of in-person contact inherent in online education may mean that only highly self-disciplined students learn well on such platforms (Hoxby, 2017).

Further, as Chapters 13–16 will discuss in detail, instructors and learners in an online learning environment require human support—perhaps even more face-to-face support than in a traditional learning environment. Because online learning occurs in virtual—as opposed to physical and temporal—space, in which learners are separated from instructors and the how, where, and when of working and learning are highly unstructured, human support is not *less* important but rather *more* important for teacher success, especially for novice online learners. This support can be online, blended, or face-to-face—and though not a cure all, it must occur (Halkic & Arnold, 2019). As international examples of Web-based distance education programs demonstrate, there are indications that online programs using such supports enjoy higher rates of success than those that do not (Means et al., 2009).

Online learning suffers from equity issues

This chapter has discussed the high attrition rates associated with MOOCs and their disproportionate effect on low-income, at-risk, and marginalized learners. This is not unique to MOOCs. Indeed, online learning writ large suffers from a "global achievement gap" (Kizilcec & Halawa, 2015) as the equity issues that persist across the higher education system are also prevalent in online courses (Acosta et al., 2021). Attrition rates are much higher among certain groups—learners who are poorer, learners from the Global South, those who may not have been raised speaking the online course language of instruction, and those who struggle academically (Acosta et al., 2021; Mitchell, 2020, as cited in Burns, 2021; Kizilcec et al., 2020).

A 2011 review of 36 studies on online learning in community colleges (typically two-year higher education institutions in Canada and the United States) found that online coursework actually may hinder academic progression for low-income and underprepared students. Learners are less likely to complete courses if they take them online, although this tendency may be "particularly pronounced among community college students, who tend to be disproportionately low-income and academically underprepared … tentative evidence suggests that taking online courses may discourage learners from returning in subsequent semesters and moving on to subsequent courses in their program sequence" (Jaggars, 2011, pp. 9, 17).

Even where supports are provided, as in the case of refugee learners in the Kiron initiative (Germany), course completion statistics are troublesome. Approximately two-thirds of learners had not completed any online course after 10–15 months of studying with Kiron (Halkic & Arnold, 2019). The authors expound on the layers of challenges that confront many online learners:

> *Online education is by no means a straightforward solution for educational challenges ... [catering] for disadvantaged groups by use of educational technologies [is a] complex endeavor. The intricate needs, the life situations, the idiosyncrasies and, more often than not, the diversity of the target groups have to be considered as far as it can (re)produce social inequalities ... (Learners) who study online are still bound to their life situations with places and time budgets that might not be conducive for online studying* (p. 361).

These disproportionately high attrition rates among less-affluent groups of learners discussed earlier in this chapter may undercut one of the more compelling arguments for online learning—that it provides equitable access to learners for whom face-to-face learning is not an option (Burns, 2020a).

Online learning has a "high status" problem

While some forms of distance education suffer from low status (for example, radio and IAI), online learning has the opposite problem—often undeservedly high status. It is often seen as an attractive option for national teacher distance education programs, even when countries lack the necessary infrastructure, connectivity, and inputs to ensure that online learning has any chance of succeeding. Questions about the readiness of a country's teachers to study online, the availability of robust infrastructural networks, the availability of qualified digital designers, online instructors, and digital resources often are overridden by policymakers' infatuation with all things digital. This bias toward online learning is frequently coupled with a failure to understand the cost, complexity, and time associated with robust telecommunications infrastructure, equity, quality, design, instruction, preparation, support, and development of digital materials.

While this section has essentially assessed the pros and cons of online learning, two challenges remain in terms of the merits or demerits of online learning for teacher professional development. The first has to do with self-sorting. With more options for professional development, teachers may arrange themselves into online, blended, or in-person modes of distance learning, thus making assessment of the real benefits and tradeoffs of purely online versus blended or in-person learning more difficult.

The second is around expectations. Online learning, for all its promise, is not a panacea and will not fix the logistical, financial, and human resource problems that beset teacher training programs. Online learning cannot fix recruitment and selection of poorly qualified teachers. It cannot fix low-quality pre-service and in-service education programs; expecting that an online intervention can do so is folly. Rather, it just disseminates, indeed scales, poor quality programming to more teachers. Online education initiatives stand a greater chance of success when all elements of the education system—standards, curriculum, assessment, supervision, leadership, etc.—are developed, coherent, and horizontally aligned throughout the education system. In far too many systems this is not the case.

5.9 Summary of Online Distance Education

Online learning resurfaces throughout this guide, most notably in Chapters 9 and 11-19 in Section II of this guide. Figure 5.9 summarizes the role of online learning and its strengths and limitations as a mode of teacher distance education.

Figure 5.9
Overview of Online Learning for Teacher Education

Roles in Teacher Professional Development	Strengths	Limitations
• Online learning blends all modalities of distance education—print, audio, visual, multimedia—with real-time communication. • It is used for pre-service, in-service, and continuing education for teachers (for example, for renewing licensure or promotion). • Online learning can provide structured and unstructured training and professional development for teachers. • It can support formal and informal teacher learning. • Online mentoring, online professional learning communities, computer-mediated communication, and social networking sites provide school-based coaching, mentoring, and follow-up for teachers. • It provides teachers with access to learning resources that otherwise might be unavailable locally. • Accredited online courses help teachers upgrade qualifications, participate in enrichment, or fulfill continuing education requirements and do so from their homes or schools. • Social media allow teachers to collaborate and share ideas with distant peers.	• Online learning is convenient—any time, any place, any pace—as long as a teacher has Internet access. • Asynchronous written communication (e-mail, discussion boards) can prompt more reflective and considered participation. • Asynchronous online courses, social media, and MOOCs offer scale—they reach large populations of teachers. • Many synchronous courses may be a worthwhile substitute to in-person learning. • Online and blended coaching, mentoring, and communities have been shown to reduce isolation experienced by new teachers (one of the major contributors to teacher attrition). • Online learning offers permanence—all materials and conversations can be archived; it leaves an electronic audit trail—teachers' use and activity can be monitored and quantified. • Social media are typically free or low-cost, easy to use, engaging, and promote personal and participatory communication. • The Internet allows teachers to tap into collective wisdom of "the crowd" and form their own professional learning communities. • Social media and cloud-based applications help defray costs of expensive software licenses.	• High entry barriers: Teachers must have access to a computer and Internet, plus language and technology skills to successfully participate. • Online learning depends on regular access to computers and the Internet. • Policymakers and planners often see online learning as cheap and easy professional development, requiring limited personnel and support, when the opposite is true. • Over 60% World Wide Web is in English with much of the remainder in Mandarin, Russian, Spanish and a handful of other languages. There are comparatively fewer limited local-language offerings online (Bhutada, 2021). • Many self-paced online courses lack high-quality or interactive content. • Issues of quality control still plague online offerings. • Social media struggle with quality and accuracy: Expertise and quality assurance may give way to the "cult of the amateur" (Keen, 2007, as cited in Burns & Bodrogini, 2011). • Social media also struggle with the prevalence of misinformation and disinformation. Teachers must have strong digital citizenship skills, and many do not. • Many formerly free SaaS sites have become monetized (e.g., *VoiceThread*) and former popular educational social networking platforms have been closed and content lost (e.g., *Edmodo*).

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