DISTANCE EDUCATION FOR TEACHER TRAINING:

Modes, Models, and Methods

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Section I. Chapter 6

MOBILE-BASED DISTANCE LEARNING

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Many of the features and functions available on more complex and expensive computers can increasingly be found on mobile devices.

Mobile devices, in the form of tablets and smart phones, have had a transformational impact on teacher learning. Each successive generation of mobile networks—from 1G to 5G—has allowed teachers to receive voice and text support from coaches; access Internet teaching resources via broadband data; communicate with peers via voice, text, and Voice over Internet Protocol (VoIP); stream teaching videos; participate in synchronous online classes; and unicast and broadcast lessons to students and teacher colleagues during COVID-19 pandemic school closures.

With 92% of the world's population in possession of a mobile phone (84% of which are smart phones), it's fair to say that, like radio and television, mobile phones are a technology teachers own and know how to use (Bank My Cell, 2022). GSMA, an industry organization representing the interests of mobile network operators worldwide, estimates that as of 2021 there were 4.2 billion global mobile Internet subscribers and that the coverage gap—the percentage of population living outside of areas covered by mobile broadband networks—had fallen to 6% (GSMA, 2022, p. 2).

As will be seen in this chapter, mobile technologies have become indispensable tools for teacher learning. Their greatest value may be that they circumvent traditional barriers to technology adoption. Where laptops can be expensive, mobile phones are more affordable. Where Internet access can be both limited and inconsistent, phones take advantage of more ubiquitous cellular networks. And where computers and various software applications may have steep learning curves, phones, tablets, and the apps that power them are far easier to learn and use. These relative advantages in terms of access, cost, and ease of use translate into potential opportunities for mobile learning or "m-learning"[1] for teachers that are flexible, portable, networked, and ubiquitous (at least where there is cell phone coverage).

Mobile technologies have provided an alternative way to engage teachers in ongoing learning and support. They can deliver text, audio, video, multimedia (both simple and more complex, such as digital learning games); they can be used with the five modes of distance education already discussed in this guide; and the abundance of educational applications developed for mobile platforms makes them a highly promising mode of teacher professional development. As will be discussed in detail in this chapter, governments, broadcasters, non-governmental organizations, and educational institutions have capitalized on the availability of mobile devices and ubiquitous networks to provide pre-service and in-service teacher teachers with content, instruction, support, and guidance. But, as will also be

[1] Also referred to as "u-learning" for ubiquitous learning.

discussed in this chapter, mobile technologies are not a silver bullet, and they suffer from intrinsic design weaknesses that can dilute their potential for professional learning.

Though "mobile technologies" encompass an array of handheld devices (and laptops), this chapter focuses exclusively on digital tablets and in particular on smart phones.

6.1 The Mobile Learning Environment: Apps, Tablets, and Phones

We begin by exploring the core elements of the mobile learning ecosystem: hardware (tablets and phones) and apps.

6.2 Hardware: Digital Tablets and Phones

6.2.1 Digital Tablets

Digital tablets[2] include the iPad and other touch-screen portable devices such as Samsung tablets. (Figure 6.1 outlines the digital tablet's origin story and the dramatic impact tablets have had on education.) While most of the research on tablets focuses on their use by *students*, providing tablets to teachers has been a core technology activity of many governments, such as those of Brazil, Cabo Verde, Ireland, and Turkey (Burns, in press; Burns et al., 2019; Trucano, 2015). Such dissemination has provided a range of benefits to teachers, helping them to get oriented to technology, search for information, teach via tablets (using a smart pen and Interactive Whiteboard), and introducing blended learning (via tablet stations).

Figure 6.1
The iPad

For a device that is barely more than a decade old (debuting in 2010), digital tablets have had a profound effect on how educational content is stored, displayed, and communicated.

The first tablet was Apple's iPad—essentially a hybrid iPhone and laptop, with a 7- to 10-inch screen, built-in wireless, and Internet networking for "always on" Internet connectivity, dual cameras for videoconferencing, and the ability to print over a Wi-Fi network. More striking than its dual functionality as a consumption and productivity tool was its form. It was lightweight and sleek, with a high-resolution LCD display powered primarily by touch and gestures.

The iPad, and its competitors, changed educational technology in multiple ways. Suddenly learners, too young to use a laptop, could instead navigate a world of engaging experiences via a touchscreen. The iPad shifted the paradigm of textbooks from one-dimensional print products to tablet-stored multimedia, immersive environments, and interactive content. Tablets redefined hardware design as touch-screen navigation largely replaced pointing and clicking (Remember the mouse?). They changed how we interact with the Internet—more through apps and less through the World Wide Web. They put technology in the hands of poor students: Kenya, Cabo Verde, Fiji, Peru, Trinidad and Tobago, Jamaica, Antigua, and Botswana are but a few of the countries that have provided tablets to a substantial portion (or all) of their student body (Burns et al., 2019; Nyamai, 2020; Sauvakacolo, 2022; UNICEF Latin America and the Caribbean Section, 2020).

These features have *not* necessarily translated into improved learning, however. A 2018 survey of more than 340,000 students in 51 countries showed that students who used tablets consistently underperformed peers who used laptops or used other types of technology configurations (Bryant et al., 2022).

[2] This is another example of the lexical variability that pervades the technology world. There are also "tablet PCs," such as the Surface Pro, that are slightly larger than an Apple or Samsung tablet and have the full functionality of a personal computer (PC). Users can input information via a keyboard or stylus. The digital tablets discussed in this chapter, like Apple or Samsung tablets, are touch-screen devices that are computer-like, but not intended to run a full PC operating system or a complete set of applications with the full functionality of a PC.

But, more importantly for purposes of this chapter, the provision of tablets to teachers has allowed them to engage in more self-directed, personalized, and differentiated professional learning. For many teachers, their tablet has become their own personalized professional learning device, which they use to access their own personal learning network (PLN) and customized menu of professional learning opportunities (Burns, in press).

6.2.2 Mobile Phones

Despite the use of tablets, the real potential of mobile learning for teachers rests with phones. This guide distinguishes between feature phones and smart phones. A feature phone is a mobile phone that has more features than a standard "dumb" or "flip" cellphone but is not equivalent to a smartphone. Such phones can make and receive calls, send text messages (SMS), and offer some of the advanced features found on a smartphone, such as some apps and some degree of Internet access. They are less expensive than smart phones.

Even the lowest end feature phone—simple voice- and text-enabled phones (also called dumb phones)—have demonstrated that they can, either alone or in tandem with other forms of distance education, be used as teacher education tools to deliver content and instruction, connect teachers to peers and facilitators, and/or provide in-class support mechanisms.

But the real power of mobile phones lies with smart phones. Essentially mini-computers, they allow users to engage with all of the distance education modalities mentioned in the previous chapters—read, listen to audio, watch videos, engage with multimedia, VR and AR-based activities, watch TV programs, surf the Internet—plus make voice calls and send text messages. Their real design strengths, besides size and ease of use, are that they are location-aware, have multi-touch screen capabilities, and are powered by "mini-applications" or "apps."

6.3 Software: Apps

It is impossible to discuss mobile learning without first focusing on the apps that power mobile technologies. Apps are mini applications, originally designed to run on smartphones and tablets and perform one task or a small set of tasks. Applications, in contrast, are software designed to perform a variety of tasks requiring lots of memory. They typically run on desktops or laptops. Like most technology products, "apps" and "applications" have converged—at least in terminology.

Figure 6.2 provides a basic overview of apps. As can be seen, some apps are Web-based desktop or mobile apps; others work for mobile and Web applications only; and some exist in all four forms. For instance, Microsoft *Office* can be accessed via a Web browser, a desktop application, a mobile app, or via the cloud but with a desktop interface.

There are broadly four types of apps used in education—social media apps, communication apps, work delivery apps, and educational apps—and teachers use them all. These may include using *Twitter* to follow a favorite educator, *Kahoot* for quizzes, *Remind* to help students remember the due date of an assignment, or *Calendly* to schedule parent-teacher meetings.[3] Smart phones, and especially tablets with touch screens, have catapulted the popularity of educational apps among students, teachers, and parents and transformed apps into a fixture in the landscape of pre-primary and primary classrooms across the globe.

[3] See *Common Sense Media* rankings of the best education apps for Apple devices: https://www.commonsense.org/education/top-picks/best-1-to-1-ipad-apps-for-learning and for Android devices: https://www.commonsensemedia.org/lists/best-android-apps-for-kids

Figure 6.2
Overview of Apps (adapted from Karch, 2021)

Type of App	Characteristics	Runs on...	Example
Web-based apps	• Run in browsers (such as *Chrome*) • Typically lightweight, versus full, versions • Many come with full set of features that require Internet connection and browser to leverage those features	• Desktops/ laptops • Tablets • Phones • Smart watch	• *Chrome* extensions • *Google* Apps for Education • *Gmail* • Microsoft *Office*
Desktop apps (applications)	• Designed for and work best on computers (mouse/keyboard interactions and large display) • Typically have lots of features and manage large amounts of data • Can be hybrid, with an online (cloud) version or offline version • Designed to operate on a specific platform (Windows, iOS)	• Desktops/laptops • Sometimes tablets and phones • Internet browser	• Microsoft *Office* • Adobe *Photoshop* • Microsoft *Outlook* • ARC GIS
Mobile apps	• Designed for smartphones and touch inputs • Lightweight, versus full, versions (See, for example, *Gmail*, MS *Word*)	• Phones • Tablets • Smart watch	• *Gmail* • Adobe *Sketch* • *Duolingo* • Microsoft *Office*
Hybrid Apps	• Offline desktop interface • Direct access to hardware and other connected devices • Always-on connection to Internet for quick updates and access to Internet resources	• Desktop • Laptop • Tablet • Phone and browser	• Microsoft *Office* • *Dedoose* • *Twine*

6.3.1 Offline Apps: Getting Content to Teachers[4]

Apps are great if teachers have access to them—but this is not always the case. While Internet access rates are rising globally, many parts of the globe suffer from low rates of Internet penetration. For example, fewer than 30% of Sub-Saharan Africans have Internet access (World Bank and International Telecommunication Union, 2022). Even if people use smart and feature phones, they are confronted with high data costs to access digital content. Thus, a number of initiatives have attempted to help teachers access apps and other content when offline.

Tools to download online content

Downloading online content makes it available offline. Open-source platforms, such as *Kolibri*, provide offline access to a curated library of open-licensed educational content with tools for pedagogical support. The popular, phone-based app *Ustad* allows users to access content

[4] This chapter discusses apps and mobile content. Chapter 12 discusses digital content for other modes of distance education.

offline, brand their site (so a school could create a logo and essentially a landing page in *Ustad*) and, if users are near one another, share content. RTI International's open-source platform, *Tangerine Vanilla*, though used for assessment, also allows teachers to import and create content for offline use (C. Strigel, personal communication, July 18, 2022).

The Raspberry Pi and Orange Pi,[5] both fairly low-cost, credit-card–sized computers that plug into a computer monitor or TV, allow teachers to access and cache rich and interactive websites and content (BRCK Education, 2015). Websites and tools, such as *eGranary Digital Library,*[6] *HTTrack,* and *BluPoint* allow teachers to cache digital content, download Web content and store it locally, or provide digital offline technology for free to educators and allow use of digital content even when there is no Internet available (Burns, 2021; The World Bank Group, 2021).

Preloaded content via phones and tablets

Offline tablet initiatives, such as, Kenya-based *KioKit* (part of BRCK Education) and *e-Limu* offer access to pre-loaded content on tablets or phones in areas where there is no Internet access. The Instant Network Schools (INS) program, developed by the United Nations High Commissioner for Refugees (UNHCR) in partnership with the Vodafone Foundation, provides offline digital educational content via tablets to 126,00 refugee students and 1,600 teachers in the Democratic Republic of the Congo (DRC), Egypt, Kenya, Mozambique, South Sudan, and Tanzania. Teachers and students download these resources via the Internet at community hubs and then access them offline via the local area network (Vodafone Foundation, 2021).

One of the most successful tablet-apps initiatives may be *onetab*, from the U.K.-based nonprofit, onebillion. Through *onetab*, an offline, customized Android tablet, students interact with *onecourse*—a set of adaptive, local-language literacy and numeracy learning apps, largely for self-instruction. The initiative first began in Malawi,

Figure 6.3
Stepping Stone

Stepping Stone, created by Education Development Center, is a growing suite of apps built on a single, open-source platform, designed to create mobile learning experiences for Android devices. It was the first mobile learning app maker designed specifically for diverse contexts in the Global South and requires no coding skills to create content. It incorporates audio, video, animation, and text files into apps. Content authors can create content on the *Stepping Stone* authoring site, which can then be downloaded by these apps to run offline. If downloads to mobiles are not possible, content can be packaged on a computer and imported to a device via a USB drive. Content can be preloaded on donated devices or distributed to existing tablets or Android phones via micro-SD cards. The activities stimulate engagement, illustrate application of ideas and methods, and promote active practice by users.

To date, *Stepping Stone* has been used in 2,000 Zambian schools. A 2017 RCT of 619 Zambian students involving three arms (one receiving *Stepping Stone*; a second getting *Stepping Stone* and worksheets; and a third serving as a control group) showed that both treatment groups led to strong gains and a significant reduction in zero scores among readers of an oral passage. While the Worksheet group showed significance at $p<.05$, the *Stepping Stone*-only group was highly significant at $p<.001$. Effect sizes were small (0.06) for the Workbook schools versus moderate (0.42) for the *Stepping Stone* schools. Additionally, providing *Stepping Stone* training phones to all schools for a further two years raised the rate of emerging readers to 9% nationwide (Richmond & Vinagradova, 2017).

[5] For a comparison of the two, see https://www.educba.com/orange-pi-vs-raspberry-pi/

[6] Thus far, this is available only to teachers and students in India, Pakistan, and Bangladesh.

and currently operates under a variety of names in Tanzania, Sierra Leone, Nepal, and Brazil—and, in a rare case of Global South to Global North transfer, in Canada, the United States, and the United Kingdom (onebillion, 2022). A number of studies[7] point to the effectiveness of *onecourse* apps on student achievement in math and English (Outhwaite et al., 2017; Pitchford et al., 2019).

Content via SD cards and SMS

Transmitting content via a high-capacity memory card is another route for getting content to teachers. South Africa's Department of Basic Education (DBE) has distributed its national curriculum to teachers in rural areas via a secure digital (SD) card, as have such initiatives as Puerto Rico's Technology Application in Mathematics Teaching (Aplicación de la Tecnología en la Enseñanza de las Matemáticas [ATEMA]), which uses Khan Academy videos to help teachers improve math instruction in grades 4–8 (Rivera et al., 2022). In Papua New Guinea, the SMS Story project leveraged text messaging to provide stories and lesson plans to teachers in rural and low-resource settings with limited access to textbooks (Miao et al., 2018).

Content creators

App makers and commercial and open-source eLearning platforms, such as Articulate *Storyline* and *H5P*, respectively, allow digital designers to make digital content, apps, and games accessible in an offline format, provided it doesn't contain links to the Internet. Through easy-to-use app creators, such as open-source toolkits like the previously mentioned *Ustad*, teachers can create

Figure 6.4
Text2Teach

Cell phones aren't just content repositories, they also are display devices. For example, in Bangladesh's national English in Action initiative (discussed later in this chapter), teachers received SD cards with hundreds of audiovisual and text-based teaching resources—and they also received battery-powered portable speakers and projectors that connect to phones so students could hear and watch English programming (McAleavy et al., 2018). EDC's USAID-funded Literacy, Language, and Learning (L3) Initiative in Rwanda (2011–2017) did something similar, connecting IAI-loaded phones to speakers for purposes of audio instruction.

One of the most enduring examples of phones as display devices is Text2Teach, initiated in the Philippines in 2003 as Bridge IT. It was designed to reach underfunded and neglected state primary schools and their communities in the Philippines, especially those in remote areas, and to standardize the quality of instruction in these schools through high-quality multimedia.

Text2Teach provides full-access interactive multimedia packages in English, science, and mathematics for Grades V and VI pupils as well as quality training to teachers. Teachers are given cell phones with pre-installed multimedia and video clips; a 29-inch color television; print-based teacher guides and folios in English, science, and mathematics V and VI, and face-to-face training. Phones are connected to television via cable, and the teacher uses the multimedia and video and follows the guide as he or she teaches the lesson.

Implemented by the Text2Teach Alliance, composed of Nokia, Ayala Foundation, Globe Telecom, SEAMEO INNOTECH, local government units, and the Philippines Department of Education, the program is still in existence. However, rigorous data about it are hard to come by. As of 2014, Text2Teach had been used with almost 4,000 teachers and approximately 310,000 students in 897 Filipino primary schools. Students improved in math and science; teachers displayed improved competence in using technology and a more positive attitude toward technology as a teaching tool (GSMA, 2014; Robles, 2018).

[7] Onebillion has an extensive list of evidence-based studies that can be found on its Web site: https://onebillion.org/impact/evidence/

customizable m-learning content such as audio, video, quizzes, and games for smartphones and tablets. Another such tool, *Stepping Stone*, is profiled in Figure 6.3.

Commercial apps

Many school systems, and many of the initiatives above, may depend on commercial educational apps or free versions thereof, typically purchased through Google *Play* or Apple's App Store, that can be run online or in a hybrid form. These apps may have numerous benefits—they are frequently professionally designed, combine entertainment with learning, are easy to use, promote interactivity, offer academic assistance, and learners find them engaging (Menon, 2022). But despite the prevalence of such apps in schools across the world, many, if not most, of these products are unregulated and untested for learning in any meaningful way and there have been few comprehensive reviews of the educational quality of children's apps marketed with a variety of educational objectives (Hirsh-Pasek et al., 2015; Meyer et al., 2021).

In one of the only studies examining educational apps, Meyer et al. (2021) analyzed 100 children's educational apps with the highest downloads from Google *Play* and the Apple App Store,[8] as well as 24 apps most frequently played by preschool-age children. Each app received a score of 0–3 on each of the following four "pillars"—active learning, engagement in the learning process, meaningful learning, and social interaction. Scores then were summarized and categorized according to cut-off scores. Overall scores were low across all four pillars. Free apps had significantly lower Pillar 2 (Engagement in Learning Process) scores (t-test, $p < .0001$) and overall scores (t-test, $p < .0047$) when compared to paid apps, due to the presence of distracting visual and sound effects and disruptive advertising. Half of the paid apps sampled, which parents may assume are of higher quality, scored in the lower-quality range (≤4). Only 7 of the 124 apps earned a total score greater than 8, suggestive of a higher quality educational experience in the app, and only two paid apps scored a 10. These results highlight the need for improved design of educational apps guided by developmental science (Meyer et al., 2021, pp. 1, 3, 9, 10).

Apps are discussed here at length because they are a critical content and instructional support for teachers. Outhwaite et al. (2019) suggest that apps that are grounded in learning science theory can "embody the principles of active, engaged, meaningful, and socially interactive learning with a specific learning goal [and] can provide numerous learning benefits for students" (p. 285). High-quality app-based instruction, like that used by onebillion, can standardize quality math and literacy instruction in both high- and low-income countries (Outhwaite et al., 2019). They can serve as individual and group-based self-study tools for students—and their teachers—particularly in areas where there is conflict, or where there are no teachers or only poorly trained ones.

6.4 Mobile Learning for Teachers

The tablet-based apps and associated digital content discussed above are primarily directed at student learning. But as reiterated throughout this guide, even content and experiences designed for students offer direct and indirect benefits to teachers. These transcend simply providing teachers with much-needed content and curriculum materials without the need for Internet. Some of the indirect benefits are enumerated in the following pages.

6.4.1 Instructional Supports

Apps can be used to support instruction. For example, employing onebillion's *onecourse*, teachers often connect the tablet to a projector and use the apps to support direct instruction. Granted, this is a small step, and still didactic, but at least it represents an incipient use of technology and a shift away from text on a chalkboard.

[8] At last count, in 2015, the number of educational apps in the Apple App Store exceeded 75,000 (Van Nostrand et al., 2022).

Tablet-based apps also facilitate teachers' shift from a unitary direct-instruction model toward more learner-centered approaches by introducing the concept of competitive and collaborative play as part of learning. Teachers may resist such group-based approaches because they lack sufficient learning materials, but students organized in small-to-medium groups interacting with well-designed subject-specific aps may alleviate such a concern. A combination of tablets with apps, professional development, and scripts or guided lessons could conceivably help teachers embrace a range of simple learner-centered pedagogies. As an example of this, see the description of *Text2Teach*, in Figure 6.4., which uses mobile phones in combination with TV to support teachers' evolving instructional practices.

App-based instruction also can relieve the teacher of the sole burden of teaching—the app is a digital co-teacher—and remove the sole burden of designing assessments since assessment is often is built into the app.

Further, apps also allow teachers to "blend" learning. For example, children can work in small groups with their tablet-based apps while the teacher individually tutors a small group of children who might benefit from such guidance (Outhwaite et al., 2019, p. 285). Or vice versa—app intervention might be particularly beneficial for low-achieving children requiring remediation or more personalized instruction, thereby freeing the teacher to provide whole-class instruction. Using a learning stations approach, teachers could set up multiple learning stations—one of which includes a tablet—through which groups of students rotate to complete an assignment. Blended approaches such as these can assist teachers in offloading the work of direct instruction of foundational knowledge and skills so that they can spend more of their time developing relationships with their students; introduce peer learning in the classroom; provide individualized support to students; and orchestrate activities that foster deeper learning. All of these activities represent an incremental step toward a classroom instructional model that is more self-directed, mastery-based, and includes blended learning versus one-size-fits-all, rote-based instruction (Arnett, 2021) and they are made possible by tablets loaded with educational apps.

Finally, as the example of *onecourse* suggests, instruction with interactive apps can significantly raise learning outcomes compared to standard pedagogical practice. Digital technology interventions that utilize high-quality, curriculum-based, interactive apps can effectively raise student achievement in early-grade reading significantly more than standard practice does (Pitchford et al., 2019, p. 5).

These are indirect benefits of apps and mobile technologies for teacher learning. But mobile technologies have a much greater direct impact on teacher learning, as the next section discusses.

6.4.2 Mobile Teacher Professional Development and Support

Across the globe—particularly in some of the world's poorest countries in Sub-Saharan, Africa, Asia, and Latin America—mobile learning increasingly has assumed a salient role in teacher professional development, particularly during COVID-19 pandemic school lockdowns.

Like online professional development for teachers in wealthy contexts, mobile professional development provides teachers in poorer contexts with access to information, experts, experiences, and resources that otherwise would be unavailable because of geographical constraints, lack of skilled teacher educators, and scarce professional development opportunities. Indeed, for billions of the world's citizens, including its teachers, computers and the Internet still are unaffordable and out-of-reach.

Thus, for many teachers, mobile-based professional development is a lifeline to learning. As the following examples show, many of the applications on mobile phone apps, such as

social media,[9] messaging apps, video, and audio make for professional development that can be diverse, collaborative, personalized, and situated in teachers' places of learning. This learning often substitutes for formal face-to-face education or is designed to augment it.

Basic literacy and numeracy

Teachers in many contexts may struggle with basic literacy and numeracy. Projet d'Alphabetisation à Base Cellulaire (Projet ABC), a long-running cell phone literacy project in Niger,[10] directed at adults, is an example of how the most basic features of a phone—its alphanumeric keypad—can help teachers develop literacy skills in the national languages they must teach but may not fully grasp.

In this model of mobile learning, phones were programmed with a digital curriculum in the local languages of Hausa and Zarma. Local facilitators, trained by Niger's Ministry of Education, taught the Projet ABC literacy curriculum. Using SMS, learners studied basic functional literacy and numeracy for three hours per day. In the first year of Projet ABC, they learned how to use the phones themselves, while in year two, they began to study a digital curriculum that included phonetic activities and varied texts that were used to develop literacy skills further (United Nations Educational, Scientific and Cultural Organization, 2015).

Two years after the end of the program, learners in Projet ABC villages had reading scores that were significantly higher than those in standard adult education classes, and women and younger students were better able to decode numbers. Aker & Ksoll (2020) attributed this to more active mobile phone usage in Projet ABC villages. These results suggest that short-term learning gains associated with technology can persist, especially if students have the opportunity to practice with that technology after the end of classes (Aker & Ksoll, 2020).11

Basic skills for adults

Cell-Ed is a mobile learning program designed to teach adults essential skills—reading, writing, oral communication, numeracy, and work and social skills—via any type of mobile phone (basic models or smartphones), even without a data plan. It began in the U.S. and since has expanded to adults in Chile, Ghana, Kenya, and Nigeria. By taking courses provided by Cell-Ed over their mobile phones, people with low literacy skills can practice and enhance their skills.

The learning sequence works like this: Learners complete a pre-assessment to ensure they are placed in the appropriate course and the course is personalized for them. They begin the lesson—an audio introduction accompanied by a text message (SMS) on their mobile phone. The automated Cell-Ed "teacher" (a voice recording of a Cell-Ed live coach) explains the information contained in each SMS and students complete this lesson. The lesson is followed by an assessment in which learners respond to questions that have been texted to them, using vocabulary or grammar they have learned in the lesson. If learners pass, they are allowed to continue on to the next lesson; otherwise, Cell-Ed helps learners by sending additional instructions. A live Cell-Ed coach can step in and provide extra help via SMS or a conventional phone call, or they can use the app. As learners successfully complete each levelled task, they receive individual certificates (UNESCO Insititute for Lifelong Learning and Commonwealth of Learning, 2021, p. 48).

Self-study in content areas

Phones and tablets increasingly serve as a distribution channel for content for self- and group-study. For example, many of the student-facing apps mentioned in the previous section also can be used as teacher training tools: game-based apps in which users virtually experience World War

[9] Social media was discussed at length in *Chapter 5: Online Learning* and will not be revisited in this chapter.

[10] The program was designed by the Fletcher School at Tufts University, funded by USAID, and implemented by Catholic Relief Services, CARE, and Helen Keller International.

[11] The researchers have continued this research with immigrant adults in Los Angeles, California.

II, apps that help users with mathematics, apps that allow users to download and read free books on a mobile device, and so on.

In the Indian state of Madhya Pradesh, TESS India has created responsively designed (i.e., designed for phones) adaptations of text-based OER materials and *YouTube* videos for self-study via micro-Secure Digital (SD) cards.[12] The 240,000 SD cards—one for every teacher in the state's primary schools—furnish teachers with professional learning materials that they can access as needed (McAleavy et al., 2018). Videos of Indian teachers using the same pedagogical methods in their classroom settings provide teachers with authentic models demonstrating principles of practice used in classroom teaching. TESS India also has created a set of text and video professional development apps for school leaders in order to encourage a whole-school approach to innovation (McAleavy et al., 2018).

The Democratic Republic of Congo's Ministry of Education has used *Stepping Stone* to deliver training to 77,000 teachers in all formal schools in the DRC (Richmond & Vinagradova, 2017). In Bangadesh, English in Action (discussed below) has also provided phone-based professional development materials to teachers of English, and the University of Puerto Rico enhances its in-person mentoring for teachers in the ATEMA project with phone-based SD cards that, in addition to the teaching materials mentioned previously, contain audiovisual and text-based resources for professional development in math instruction (Rivera et al., 2022).

Pre-service teacher preparation

The Future Teacher Kit from the United Nations Educational, Scientific and Cultural Organization (UNESCO) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is a mobile-based teacher training program that builds on the affordances and popularity of mobile phones and messaging platforms such as *WhatsApp, Telegram,* and *Signal* to provide teachers with a mobile-based training in 20 Caribbean countries and territories—Anguilla, Antigua and Barbuda, Aruba, The Bahamas, Barbados, Belize, British Virgin Islands, Cayman Islands, Curaçao, Dominica, Grenada, Guyana, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Sint Maarten, Suriname, and Trinidad and Tobago. Teacher "ambassadors" are trained to facilitate learning activities with teacher groups. Teachers receive training snippets and hands-on activities on their phones via messenger systems such as *WhatsApp*, *Telegram*, or *Signal,* or via interactive voice response (IVR). Within teacher peer-support groups, teachers prepare lessons, exchange administrative information and teaching resources, share their experience implementing the hands-on activities they've learned, and provide feedback to one another (UNESCO & GIZ, 2022).

Language instruction

Across Sub-Saharan Africa, teachers must deliver instruction in a "national" language they may not speak—French, English, Xhosa, Swahili, or Portuguese. Many other teachers may lack the ability to read or write in any language. In such cases, mobile phones have proved to be especially suitable for language learning. Skill builders (e.g., Education Development Center's *Stepping Stone* platform), simple educational games, apps such as *Duolingo* and *Mondly* (mentioned in Chapter 4), and even the use of the alphanumeric functions of phones have been shown to successfully build the literacy and second-language acquisition skills of adult learners, including teachers (Aker et al., 2012; Jiang et al., 2021; Richmond & Vinagradova, 2017). A small study of Syrian refugee teachers in Lebanon and Sweden showed that teachers were able to improve language learning by using their phones to interact with apps,

[12] TESS-India materials are available in seven versions, one for each of the Indian states in which the program operates. The other six states also put videos on SD cards but on a smaller scale than in Madya Pradesh (F. Wolfenden, personal communication, October 12, 2022).

translation services, video (such as *YouTube*), and social media (Bradley et al., 2019).

English in Action (EIA), a joint project between the British Broadcasting Corporation (BBC), Cambridge Education, Mott McDonald, the Open University of the United Kingdom, and the Government of Bangladesh, may be the most well-known phone-based language instruction program in the world. EIA targeted the English-language competencies of 100,000 teachers as well as those of the general population. The core delivery system of English instruction to teachers was either through a simple voice call or by texting a four-digit code which allowed access to hundreds of two-to-three minute English-language audio phone-based lessons, audiovisual files, and quizzes, all aligned with the national English textbook. Content was updated weekly and was differentiated so learners could follow the course at their own speed. As of 2018, over two million Bangladeshis had accessed the 140 bilingual audio lessons that were available. The mobile phone lessons recognized the learner's phone number and so learners could resume from their previous stopping point the next time they called in.

A series of studies from 2011–2018 indicated improvements in English-language instruction, an increase in teachers' use of English during instruction, and "significant improvements" in teachers' English language skills since the original baseline test in 2010 (Walsh, 2011, as cited in Burns, 2015; Eyres et al., 2014, as cited in McAleavy et al., 2018; McCormick, 2018). Ninety-five percent of teachers surveyed reported that EIA had helped them improve their own language skills, and 90% felt that EIA positively affected their teaching (English in Action, 2018). Data such as these suggest that it may be a successful example of using low-cost technology (phones) to deliver high-quality professional development to teachers at scale (McAleavy et al., 2018, p. 33).

Access to online courses

In many contexts, mobile learning for teachers is essentially an extension of online learning—but on a smart phone or tablet. In countries where online learning is common and teachers have access to strong cellular networks and Internet, tablets, and smart phones, they may choose to access their online courses via these mobile devices. Given the popularity of mobile technologies, many, if not most, online courses for teachers are designed "responsively"—an approach to Web design that ensures that course content and interfaces work well on a variety of platforms (laptops, tablets, smart phones). Thus, as a teacher switches from her school laptop to her home tablet or smartphone to take part in her online course, the website should automatically switch to accommodate the resolution, screen size, image size, and the scripting abilities of that particular device.

6.4.3 Mobile Support and Coaching

Phone-based messaging apps, such as *WhatsApp* groups, have proven to be an important and popular lever in creating professional learning communities for teachers. This is particularly evident for refugee teachers such as those in Syria, Lebanon, Jordan, and Bangladesh, who use phones and social media to share teaching ideas and resources and to offer one another educational and emotional support (Burns, in press). The SMS and Multimedia Messaging Services (MMS) features of phones allow teachers to gather and share ideas about appropriate teaching tools and resources with external experts and with one another (Ekanayake & Wishart, 2014). The one-to-one and one-to-many communication abilities of mobile devices mean that they can help promote coaching that is both private, individualized, and personalized while and also being collaborative and public.

Teacher support groups during COVID-19 pandemic school lockdowns

The power of mobile learning for teacher support was perhaps most evident during COVID-19 pandemic school lockdowns. Teachers in countries as diverse as Ecuador, México, Honduras, the U.S., Ireland, South Africa, Sweden, Lebanon, and India extensively used *WhatsApp* to form spontaneous

teacher support groups—mainly *within* schools but also *across* schools. The instant messaging and free voice call components of *WhatsApp* also helped them stay in touch with students (Burns, in press). So prevalent was teacher use of *WhatApp* during COVID-19 pandemic school lockdowns that numerous ministries of education pushed out teaching and learning materials to teachers via *WhatsApp* (Cobo et al., 2020).

Professional learning communities: English in Latin America

There is ample evidence of the power of phones and social media in tandem promoting communities of learning. For example, EDC's English for Latin America (ELA), an interactive audio program that provides teachers with tools and lessons to teach English effectively, has since 2013 maintained *WhatsApp* groups for teachers in Honduras, the Dominican Republic, and Panamá. These groups streamline workflow—teachers are organized into one group where they can communicate with EDC and with each other and where documents, pictures, audio files, and videos can be shared with all teachers at once.

More critically, the community sharing aspect has pushed teachers toward greater implantation of ELA methodologies. One of the most compelling components of ELA is the segment including songs for learning English that sound like Latin American pop songs.[13] In *WhatsApp*, teachers share videos of how they've applied the ELA methodology in classes. Most parts of the world have some form of the reality television programs *The Voice* or *American Idol*; thus, the competitive nature of the shared songs makes such video sharing attractive, particularly in a platform that allows for wide sharing but is not completely public. The fact that videos are pushed to teachers' personal accounts means that teachers don't have to go to a site or page somewhere to see them. All of this is highly motivating. Teachers who might not otherwise be as willing to participate share things or do activities with their students because they see other teachers doing it. Via *Facebook*, students, parents, and teachers can access the videos (K. Yasin, personal communication, July 19, 2022).

Learning communities will be discussed again in greater detail in Chapter 15.

Mobile mentoring in Kakuma Refugee Camp

Phones, combined with messaging apps, appear to represent a potentially powerful coaching and mentoring duopoly. In Kenya's Kakuma Refugee Camp (one of the world's largest), Teachers for Teachers—a joint initiative of Teachers College, Columbia University; the United Nations High Commissioner for Refugees (UNHCR); Finn Church Aid; and the Lutheran World Federation—takes refugee teachers (only a third of whom are formally trained to teach) through a series of face-to-face professional development workshops developed by the Refugee Teacher Working Group (RTWG) (Mendenhall et al., 2017, pp. 4, 5, 7; M. Mendenhall, personal communication, March 21, 2022).

Upon completion of the face-to-face workshops, all participating teachers are assigned a global mentor, who provides six months of online practical support. These mentors are recruited and trained through online webinars and connect on a regular basis with groups of four to five refugee teachers over *WhatsApp* and a private *Facebook* page to share experiences, offer teaching tips directly connected to the training through a mobile mentoring curriculum developed to complement the training pack, and problem-solve in real time on issues teachers face in the classroom (Mendenhall et al., 2017, p. 7). The mentors come from 18 countries, including graduate students at Teachers College, Columbia University (U.S.) who were themselves teachers. Safaricom Foundation provides all teachers with phones, airtime, and data (M. Mendenhall, personal communication, March 21, 2022).

[13] Learn more and hear some of the songs here: http://englishforlatinamerica.org/

The main topics of *WhatsApp* conversations focus on overcrowded classrooms, student attendance, and classroom management (Mendenhall et al., 2017, p. 8). Nearly half of teachers reported that they had successfully implemented activities shared within their *WhatsApp* groups; that *WhatsApp* can provide self-sustaining teacher professional development; and that mobile-based mentoring can be adapted and implemented in other crisis-affected contexts at a relatively low cost (McAleavy et al., 2018, p. 42). *WhatsApp* is also an attractive technology because users don't incur extra data costs to use it.

While *WhatsApp* faciltates the exchange of instructional support, more fundamental is the ability of messaging apps to facilitate basic communication between communities and individuals experiencing some degree of tension, as in refugee and host communities in Malaysia and Syria (Alfarah & Bosco, 2018, as cited in Jordan & Mitchell, 2020; Shekaliu et al., 2018). This underscores the power of even the most simple communication on teachers' emotional health. Research shows that small acts of text-based interactions—checking in and simply saying "hello" via text message—is an important emotional support and contributes to a general sense of wellbeing (Liu et al., 2022).

Tablets for coaching: *Tangerine:Coach* (Kenya)

While phones are more common tools in terms of mobile professional development for teachers, digital tablets also play a key role in facilitating classroom-focused coaching: Teacher educators can use tablets to record a teacher's lesson and analyze the video together as part of post-feedback observations (McAleavy et al., 2018, p. 38).
One of the best-known uses of tablets for coaching is RTI's *Tangerine:Coach* which was developed for Android tablets and optimized for use offline.
It is currently deployed in Bangladesh, Cambodia, Georgia, Jordan, Kenya, the Kyrgyz Republic, Liberia, the Philippines, Sierra Leone, Uganda, Uzbekistan, and the West Bank (Palestine) (C. Strigel, personal communication, July 19, 2022).

This tablet-based coaching platform contains customizable, logic-driven forms, and can combine and analyze results from classroom observations to generate coaching feedback reports—all offline. In turn, the reports are used by school-based coaches to guide and inform conversations with teachers. Data from multiple users also can be aggregated through online syncing to a central server database from which Web-accessible data dashboards can be deployed to monitor educational quality (Pouezevara et al., 2019).

As the coach observes a classroom, he or she calls up the particular lesson plan enacted by the teacher. As classroom observation data are entered into *Tangerine:Coach*, the platform generates suggested feedback for the teacher—for example, to adopt a specific pedagogical practice (e.g., predictive questioning for reading instruction). Where there are videos,[14] the coach can share these with teachers to model optimal teaching. *Tangerine:Coach* helps coaches increase the quality of their instructional support to teachers, thus addressing an area of support that has traditionally been an area of weakness, and potentially resulting in more effective instructional support (Piper et al., 2017, p. 67).

Most of the data on the impact of *Tangerine:Coach* originates from its use in Kenya and Sierra Leone. In Kenya, coaches reported increased coaching visits, greater ability to track teacher and student progress, and improved quality of their own feedback to teachers—gains they attributed to the tablet-based platform (Piper et al., 2017, p. 67).

Coaching while teaching: Virtual Bug in the Ear (Indonesia, United States)

"Virtual bug in the ear" (VBIE) technology is an example of synchronous or live coaching not via

[14] RTI provides the platform, but education systems must supply the content (lesson plans, videos) that work in the platform.

a mobile phone *per se* but via a Bluetooth earpiece. It also involves *Skype* or *Zoom*, a high-definition camera in the teacher's classroom, a coach who watches the class live, and a tablet, phone, or laptop. The coach observes the class via the camera and gives real-time targeted feedback that the teacher hears via his/her Bluetooth earpiece. The information is communicated directly to the teacher's earpiece, so only the teacher hears—students do not. The teacher thus can make immediate real-time improvements in a lesson as suggested by the coach. As long as the teacher's phone is Bluetooth enabled, the coach can communicate live with the teacher via a simple voice call.

The approach, which EDC briefly trialed in Indonesia in 2008 and which is used more extensively across a number of U.S. school districts, has its pros and cons. Teachers get real-time feedback; and by using a video-based call-recording system such as *Pamela*, VBIE sessions can be saved as electronic video files and the teacher and coach can view them together after the class. In Indonesia, female teachers who wore the traditional Muslim head covering, the hijab, were more willing to try out VBIE than were male teachers whose students would notice the earpiece. VBIE also requires strong Internet access and Bluetooth earpieces to avoid audio and communication issues, and coaches must communicate in brief, clear, and direct statements.

Research on VBIE is neither abundant nor rigorous, though the application has been in use since the 1990s. A mixed-methods follow-on study from an original 2009 study confirmed that initial positive improvements in teaching practices withstood the test of time. Though not definitive, the same research found successful longer term use, as evidenced by continued improvements in teacher and student behavior that were apparent 1–3 years later with continued online BIE feedback (Rock et al., 2014).

Coaching is discussed in greater detail in *Chapter 16: Supporting Distance Learners*.

Supporting behavioral changes with phone-based nudges: Botswana, Niger, Malawi, and Kenya

In their 2008 book *Nudge*, Thaler and Sunstein popularized the notion of "nudges"—reminders or reinforcements that alter people's behavior in positive ways without requiring too much effort on their part. Mobile phones can provide timely nudges, via text and voice calls, to modify adult behaviors in ways that have positive educational effects. For example, low-income parents in the U.S. who received three weekly text messages about their children's academic skills increased their own involvement in their child's learning and saw gains in their children's early literacy by 0.11 SDs (York & Loeb, 2018). In Botswana, children whose parents received an SMS text and live phone calls from a teacher experienced gains in numerical skill, on average, of 24% (0.29 SDs) on the Annual Status of Education Report (ASER). (Angrist et al., 2020).

Nudges may also work with adult learners and teachers. In the previously-mentioned Projet ABC, additional research found that adults in Niger who received weekly phone calls as part of a two-year education program improved their math and literacy test scores (0.19–0.22 Standard Deviations) over those who did not receive weekly phone calls (Aker et al., 2012). Comparable results occurred in Malawi, where RTI used mobile texting to provide teachers with support between face-to-face training sessions. One group of participating teachers received 49 SMS messages (seven messages per week over seven weeks) in addition to face-to-face support, while a matched control group received only face-to-face support. The SMS messages were designed to "remind and reinforce" simple behaviors—for example, encouraging certain student behaviors or pedagogical reminders (Slade et al., 2019, p. 140). Results showed modest but statistically significant gains for the SMS group, with the teachers in that group better able to retain the

information presented at trainings (Slade et al., 2019). In Kenya, teachers who received weekly text-messages saw positive effects on classroom practices, with effect sizes from 0.57 to 1.15, as well as a positive effect on three of four primary measures of children's literacy, with effect sizes up to 0.64 (Jukes et al., 2016). Such "nudges" are attractive because they can be implemented using interactive voice response (IVR), which allows for higher volumes of calls and more diverse audio content.

The examples above are promising and seemingly cost-effective. However, it is far from certain that short text- and voice-based nudges can replace the richness and depth of a coaching relationship. Further, the effect sizes for nudges have been highly variable, and though all interventions may be guilty of publication bias, nudge theory is particularly culpable (The Economist, 2022). However, in environments where teachers lack relevant instructional and human supports, nudges may be effective in promoting at least some simple behaviors and may help to overcome the intention-implementation gap. Behavioral research suggests that people are eager to follow social norms but get caught up in daily living and forget to implement desirable behaviors even though they want to (LaMotte, 2021). Thus, nudges via technology with which teachers interact on a regular basis may help change behavior for the better.

6.5 Considerations: Mobile Technologies for Distance Education

6.5.1 Benefits of Mobile Distance Education

Mobile phones and tablets have myriad benefits as tools for teachers' professional learning.

Mobile technologies ensure access to formal learning and content that might otherwise be unavailable

As the examples throughout this chapter have shown, mobile technologies—particularly phones—have provided teachers with access to experiences, content, learning, resources, and people that might otherwise be unavailable. The "killer apps" of cell phones—voice and text—are still the most basic and powerful of learning tools. And mobile phones blend old modalities, such as audio and text, with new ones (e.g., social media and video). This accretive capacity means that mobile phones can provide a variety of learning opportunities, just-in-time resources and assistance, and personalized and individualized support and instruction for teachers in low-resource contexts in ways that online learning does not, and interactive audio cannot (Burns, 2013).

It also means that many of the features and functions available on more complex and expensive computers can increasingly be found on mobile devices. This convergence between mobile and Web-based media and applications essentially makes cell phones an extension of computers (or vice versa). Quick response (QR) code readers enable cell phones and camera-enabled tablets to capture print, multimedia, and Web-based data so that such data can be viewed, published to social media sites, and tracked. Mobile apps are designed so that online courses can be optimally viewed on smaller screens, with limited scrolling, so the interface optimizes the learning experience.

Mobile phones are a "bottom of the pyramid" technology

Like radio and television, phones are commonly used, shared, and owned by people in many parts of the globe. Indeed, mobile phone ownership exceeds both computer and tablet ownership across the globe (StatCounter, 2022). Phones can be leveraged for educational purposes—like radio and unlike the Internet— since many low-resource nations have well-developed cellular networks and infrastructure, and many teachers already own and know how to use cell phones.

Mobile phones are far more affordable than laptops for poor countries, even factoring in equipment donations. Indeed, the cost of mobile phone ownership has declined to the point that ownership can be found across all socio-economic groups. Cell

phone networks (through which mobile devices can connect to the Internet) are generally cheaper and more widespread than Internet coverage, providing greater access to resources and people in ways the Internet cannot do.[15]

Particularly since COVID-19 pandemic school lockdowns, many governments, as well as telecommunications companies in places such as South Africa and the United States, have worked to reduce the data costs associated with mobile learning via zero rating access to educational content. For example, in South Africa, the Department of Basic Education makes all its educational content available on its "DBE cloud," downloadable for 2 South African cents per day to access. There also are incentive programs, as in Ogun State, Nigeria, where teachers get additional phone minutes when they access educational content from certain sites (Burns et al., 2019). In the United Arab Emirates, during COVID-19 pandemic school closures, the Ministry of Education, along with the Telecommunications Regulatory Authority (TRA) and two Internet providers (Du and Etisalat), collaborated to ensure free mobile Internet access for those who lacked access at home (Ministry of Education United Arab Emirates, 2021).

Mobile technologies can provide learning and support to some of the hardest-to-reach populations

Across refugee camps, mobile learning is particularly important for refugee and internally displaced teachers, many of whom are forced to move constantly from one location to the next. With mobile devices, learning moves with these teachers (Dahya & Dryden-Peterson, 2017; Miao et al., 2018). In a multiyear study on the relationship between transnational support, ICTs, and higher education in the Dadaab, Kenya, refugee camps, Somali refugee teachers reported that mobile phones, messaging services, and social networks were critical components of their professional success (Dahya & Dryden-Peterson, 2017).

Mobile technologies can scale learning

"Scale" is a frequently utilized but underdefined concept in education. Coburn (2003) defines scale as consisting of depth, shift, spread, ownership, and sustainability, and as explained here, mobile learning indeed hews to Coburn's framework:

- Depth. Teachers know how to use mobile phones for a variety of functions; their use is not compartmentalized, as it is with computers.
- Ownership. Teachers own and value phones. Phones are often personal extensions of the human beings who own them, and people often cannot imagine not having one.
- Shift. Teachers employ phones for all facets of life—for personal, professional, recreational, educational, and economic purposes—and are thus more willing to adopt new uses of phones for novel endeavors.
- Spread. The proliferation of mobile technology projects and mobile support groups for teacher sharing of resources and ideas suggests that phones are viewed as important professional tools and mobile-based projects viewed by teachers as having value.
- Sustainability. Distance education projects can leverage the phones teachers already own for support to be provided at low cost to reach a broad audience in the form of nudges, texts, and voice messages.

Mobile technologies have made teacher professional development more relevant and responsive

Phones and tablets have influenced concepts of how, where, and when professional learning occurs. For places where mobile devices are common, online learning is widely available, and notions of professional learning are more flexible, this

[15] For instance, India enacted telecommunications reform in 1999, and many African nations have opened their telecommunications market to competition, thus depressing costs.

development is mundane. But in parts of the globe where learning is time- and place-bound, where professional knowledge is fixed in a national canon of information, and where information is transferred by a more expert "other," the changes wrought by networked mobile devices have been quietly dramatic. This was most evident during COVID-19 pandemic school closures, when teachers in many countries rejected "official" national, regional, or district online professional development in favor of self-directed learning (via *YouTube* videos), peer-based learning (via *WhatsApp* groups and the SMS features of phones), and formal learning options (via mini-courses), mostly delivered by phones (Burns, in press).

6.5.2 Limitations of Mobile Distance Education

As with all technologies, it is prudent to temper hope and enthusiasm when discussing mobile phones for teacher learning by acknowledging some of the weaknesses that accompany mobile professional development.

Mobile technologies are not a problem-free solution to teacher training

Like any technology, mobile technologies suffer from a host of technical, financial, curricular, human capacity, quality, and infrastructural issues. Cell towers can fail, phones break, communication is interrupted, and data can be expensive (especially in Sub-Saharan Africa, which has some of the highest data costs in the world).[16] Planned obsolescence is real—operating systems and devices are designed to last only so long. Not every teacher knows how to use his/her phone for learning or wants to. Access to materials and learning does not equate with quality. Phone-based curriculum materials and content may not align with the national curriculum (Tausin & Stannard, 2018). And many pre- and in-service teacher initiatives count on teachers subsidizing technology by using their own phones and paying for their own data plans.

The Digital Divide persists in mobile technologies ownership

Despite pervasive levels of phone ownership globally, the digital divide still exists in mobile phone ownership. In some of the world's poorest and most strife-ridden places, such as the Democratic Republic of Congo and the Central African Republic, mobile infrastructure is poor and mobile ownership often is limited to capital cities. Though Africa has been the continent with the highest growth of mobile phone users, Sub-Saharan Africa continues to have the lowest rate of smartphone ownership of any geographic region (World Bank, 2017, as cited in Morris et al., 2021). Indeed, ownership is still concentrated in urban areas and in a handful of countries—Nigeria, Ghana, Kenya, and South Africa (Pew Research Center, 2018). The most common type of mobile device owned by users in Sub-Saharan Africa is still a feature phone, which limits the types of learning in which teachers can engage (Morris & Farrell, 2020).

Even where people have mobile phones and where there is mobile broadband coverage, financial, literacy-related, technical, and policy-related issues have contributed to a significant "usage gap." Over three billion people (41% of the global population) live in areas covered by mobile broadband networks but do not or cannot subscribe to these services (GSMA, 2022, p. 2). Rural populations and women in the Global South are 40% and 23% less likely than urban residents and men, respectively, to use mobile Internet (GSMA, 2020, p. 12). With much of the usage gap being financial in nature low-cost mobile phone providers such as KaiOS, which also offer inexpensive data plans, platforms, and apps, may help to narrow this usage gap (Broadband Commission for Sustainable Development, 2021; KaiOS, 2021).

[16] As an example, the most expensive country in Europe for 1 GB of mobile data is Norway (5.81 USD) and the cheapest is Italy (0.27 USD). The most expensive country in Africa for 1 GB of mobile data is Equatorial Guinea (49.67 USD) and the cheapest is South Sudan (also 0.27 USD). Fifty-two African countries have data costs higher than those of Italy, and eight of those Sub-Saharan countries have higher data costs than Norway (Statista, 2021; Statista, 2022).

Laptops are still better suited to online learning

When it comes to optimal technology tools for learning, particularly formal online learning, phones still do not quite measure up to computers in terms of productivity, processing, more comprehensive interaction with content, and access to powerful applications. The phone's small screen and keyboard can make interacting with, and processing information difficult, and its operating systems, screen size, and app-based nature limit the kinds of learning activities and features that are so easy to complete on computers. Mobile learners who access their online course via a Wi-Fi connection have slower download speeds. An image that shows up quickly on an Internet-connected laptop will take longer to load on a smartphone—and of course, many feature phones simply will not support online learning. There are other issues: It can be cumbersome to read from a mobile phone (particularly PDFs), more difficult to write, images may not display properly, and many online courses may not be responsively designed, making online learning via a phone difficult and frustrating.

Teachers appreciate mobile phones for their many benefits, such as finding information and quick communication, but they report a preference for laptops over mobile phones for formal learning (Burns, in press). The danger—further elaborated upon below—is that online courses default to exclusively designing online learning for mobile phones, thereby resulting in shorter readings, less information, narrower learning experiences, and the exclusion of certain types of meaningful learning activities and materials that don't work well on a mobile device.

Mobile phones can result in a reductionist view of teacher professional development

Technology has a dualistic nature—offering opportunities for learning that might otherwise be unimaginable, while at the same time constraining and circumscribing that learning. Thus, the danger is that the technology itself becomes the professional development, rather than fitting technology into the greater corpus of professional development. While phones are valuable vehicles for professional learning for teachers who might otherwise lack access to learning, it is important to guard against a reductionist vision of learning that conflates teacher professional development and support with little more than text messages, *WhatsApp* groups, phone calls, and audio snippets versus sustained face-to-face interaction with colleagues, materials, and experiences (Burns, 2015).The fact that mobile phones can offer support to teachers that is both cheap and scalable represents an opportunity—and also a threat. All things being equal, a lot of phone-based learning is not as ideal as face-to-face or even online learning. It is better than nothing. But "better than nothing" cannot be a defining ethos for teacher professional development, especially for teachers with the greatest needs and the least amount of professional formation. Where other options are available, mobile phones should support, but not replace, more proven forms of professional development and support (Burns, 2013).

Non-English-speaking users of messaging services are particularly vulnerable to misinformation and disinformation

Misinformation is "false or misleading content shared without harmful intent though the effects can still be harmful, e.g. when people share false information with friends in good faith." Disinformation is "false or misleading content spread with an intention to deceive or secure (some personal) gain and which may cause public harm" (European Commission, 2020).

Both are spread, not simply through social media sites such as *Facebook*, as discussed in the previous chapter, they also are a prominent feature of messaging services like *WhatsApp*. The ubiquity of *WhatsApp*, its encrypted nature, lack of content moderation in languages other than English, and popularity among teachers who value their trusted teacher communities' mean that misinformation and disinformation spread more quickly.

As previous discussions of *WhatsApp*-based professional learning communities in Latin America suggest, *WhatsApp* use is particularly high in Latin America; in the U.S., Latinos get more news from messaging groups than do members of any other ethnic group (Valencia, 2021). Eighty-seven percent of Meta's spending to battle misinformation focuses entirely on English speakers (Meta is the parent company of *WhatsApp)*. Thus, an "entire continent of Spanish-language misinformation is largely unchecked by the platform" (Valencia, 2021). Information often cannot be verified, and app users and platform operators have limited means to address and intervene as misleading or harmful content spreads. Thus, a service so treasured—by the education community in general and by teachers in particular—for its ability to share knowledge and offer support within trusted circles of colleagues has commandeered these same trusted networks to promulgate lies and falsehoods.

The mobile teacher professional development research base is thin

As seen from this chapter, the use of mobile devices for teacher education purposes is a growing field with many positive empirical results (Marques & Pombo, 2021). Yet, despite collective enthusiasm regarding the cost, versatility, scale, ubiquity, utility, and ease of mobile phones, most of the research that exists hews to a few themes: phones as a delivery system (as opposed to a technology with distinct pedagogies), or how teachers can support student learning with mobile technologies (versus how mobile technologies can support formal teacher learning). Thus, claims about the impact of phones must be tempered until there is more robust and definitive research at scale.

6.6 Summary of Mobile Distance Education

Figure 6.5 summarizes the role of mobile technologies and their strengths and limitations as a mode of teacher distance education.

Figure 6.5
Summary of Mobile Distance Education

Roles in Teacher Professional Development	Strengths	Limitations
• Mobile devices can provide professional development and ongoing support and communication for teachers. • Audio, video, and multimedia can target teachers' content, instructional, and assessment skills. • Mobile devices offer teachers access to learning resources for use with students. • Mobile devices provide in-class support and consultation for teachers.	• With "anytime, anyplace" learning, teachers can access help and resources from their own classrooms. • The abundance of apps has allowed districts, regional education offices, or universities to offer customizable, differentiated, and personalized learning opportunities to teachers. • Relatively inexpensive phones and phone cards can be purchased and distributed to more teachers (compared to computers). • Mobile technologies require very little training for teachers.	• Mobile devices depend on regular access to electricity, a cellular network, or the Internet. • Multimedia and interactive content still require high mobile broadband. • Their size and portability make mobile devices easy to steal, lose, and damage. • Input/output devices (small screen and small keyboard) make typing and reading a less than optimal experience. • Planned obsolescence: Tablets and smart phones are designed to last only a few years.

Roles in Teacher Professional Development	Strengths	Limitations
• As more software has been developed for mobile phones and tablets, and as online courses have become responsively designed, mobile learning has become a popular professional development option. • Like television and radio, mobile phones have been harnessed to provide professional learning to "hardest-to-reach" teachers. • The Multimedia Messaging Service (MMS) capability of cell phones permits resource sharing (video, audio, images).	• Smart phones function as mini-computers and so can support micro-learning. • In areas with poor Internet connectivity, teachers can access the Internet via cellular networks since cell phone coverage often is more prevalent and reliable than Internet access. • The use of styluses and gesture-based input makes keyboarding a less necessary skill. • Mobile learning technologies capitalize on technologies (phones) that teachers own, with which they are already familiar, and on which they rely for a variety of functions.	• In the case of smart phones, Internet access may be robust in cities with 3G/4G/5G coverage but limited in rural areas that lack these. • Despite improvements in size, design, and functionality, teachers report a preference for online learning via laptops versus mobile learning via phones.

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