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Smartphones and language learning

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Introduction

The iPhone turns 10 years old in 2017. For the occasion, Apple is rumored to be adding significant new features for the model to be released this year. Whatever those may be, they are not likely to have the same impact that the release of the original iPhone had 10 years ago. That event led to a radical new vision for the design and capability of mobile devices. Within a short period of time, there was an industry shake-up, with Windows and Blackberry phones, the erstwhile smartphone leaders, being reduced to insignificance, along with digital music players (including Apple's own iPod) and personal digital assistants (PDAs). The original iPhone also spawned a new mobile device industry through its big brother, the iPad. Competing products, inspired by Apple touchscreen devices, soon appeared, notably Android phones and later Chromebooks. These products, in particular, have had a major impact on education, as they have made largely affordable the advanced features introduced by Apple. In this column we will be looking at what these devices have meant for language learning and literacy education. I will be arguing that the Apple-inspired touchscreen smartphone is not just another technological innovation, but rather a device that has ushered in a new era in the human–machine relationship and that, thereby, it has the potential (not yet realized) of fundamentally disrupting teaching and learning, including L1 and L2 literacies and learning.

Smartphones as Life Partners

Smartphones are phones, that is, they can make voice calls. For many smartphone owners, that has become the least important feature of the device. Text messaging (now multimedia-enabled) is much more widely used as a form of communication, particularly through mobile apps such as WhatsApp. Exchanging images and videos is an everyday occurrence for many smartphone users (often using Instagram or Snapchat), as is regular consumption of social media like Facebook and Twitter. A host of other actions are commonplace: listening to music, watching videos, using a GPS to find one's way, taking (and editing) photos and videos, checking an electronic calendar, taking notes, reading a book, and playing games. The Internet and the web are accessed through browsers, and increasingly, through mobile apps. Third-party apps extend ad infinitum device functionality.

Some of these functions were available on mobile devices before the iPhone, but the usability and functionality have been considerably enhanced through capacitive touchscreens, multifinger touch gestures, faster processors, larger data storage and memory, and improved user interfaces. Add-on, third-party apps also existed before the iPhone, but they were of minor importance and of limited practical use. The Apple App Store and Google Play now offer countless apps of all kinds, many available for free or at nominal cost. The iPhone added multiple sensors and also integrated wider networking options, including built-in Wi-Fi, Bluetooth, and (gradually) multiple cellular options. As more users have begun to rely on their phones for Internet access, cellular networks have become faster and more reliable, with service providers offering a variety of data plans. The cost of both the phone and the cellular connectivity vary depending on the device and the country. In some parts of the world, both are prohibitively expensive, given median incomes. In terms of hardware, we are seeing costs come down significantly, especially for Android phones. At the same time, inexpensive feature phones are increasingly making available features formerly found

only on smartphones. Open access Wi-Fi networks are becoming more available in many developing countries, sometimes provided by local agencies or NGOs through community centers, schools, or other communal locations.

Despite the cost, the new communication and connectivity options offered by smartphones have made them into must-have commodities in many communities. In the US, this fact has made its way into the political arena. In the healthcare debate in early 2017, Representative Chaffetz of Utah suggested that uninsured US Americans should invest in their own healthcare, "rather than getting that new iPhone that they just love" (Healy, 2017). In response, the *New York Times* ran a story profiling a family from Chaffetz' district struggling to stay afloat financially and for whom their shared phone (a two-year-old Samsung with a cracked screen) was an essential lifeline, needed for frequent communication among family members and used as the sole access point to the Internet. For affluent US citizens and others from developed countries, smartphones may play an even greater role in day-to-day lives. A recent study from the Psychological Society (2017), found that the prospect of losing a smartphone stresses Britons almost as much as the fear of a terrorist attack. For many, the smartphone is an indispensable and constant companion, used throughout the day and evening in different ways and in multiple contexts. The reliance on apps and functions has led to a level of dependence and personal intimacy new in the human–machine relationship, with the devices offering "extensions of human cognition, senses, and memory" (Moreno & Traxler, 2016, p. 78). Smartphones, for many of us, have indeed become an extension of ourselves—something like a digital appendage. It is that level of interconnection that has made the smartphone such a potential game-changer in education.

Language Learning on Mobile Devices

There have been numerous studies in recent years on the impact of mobile learning and mobile assisted language learning (MALL). Given the powerful features of the smartphone, its connectivity, multimedia support, growing ubiquity, and communication capabilities, it may seem surprising that MALL remains as Burston (2014a) comments, "on the fringes" of instructed language learning (p. 115). He points out in this study—as well as in his meta-analysis from 2015—that most published studies of mobile devices in the service of language learning are experimental in nature (with often no follow-up), have short time frames (often four to six weeks), and tend to focus exclusively on vocabulary development. Most MALL projects emphasize drill-type exercises, rather than communicative activities. As Burston (2015) comments, "nearly all [studies] presuppose a behavioristic paradigm involving rote learning and structuralistic tutorial exercises" (p. 16). His extensive annotated bibliography of MALL studies (2013) provides ample evidence of his assertion.

Other meta-analyses and studies of MALL projects in recent years have yielded similar results (e.g., Bozdoğan, 2015; Duman, Orhon & Gedik, 2014; Steel, 2012; Sung, Chang & Yang, 2015; Viberg & Grönlund, 2012). These studies indicate that MALL projects have by and large neglected to take advantage of the communication and collaboration features of modern mobile devices:

> Ironically, it is precisely in the areas where they potentially have the most to offer—mobility, peer connectivity, oral interactions, and learner collaboration—that the advanced communication features of mobile phone technology have been, and continue to be, the least exploited in MALL. (Burston, 2014b, p. 350)

MALL projects generally lack a theoretical framework (Bozdoğan, 2015), give little attention to learning strategies (Viberg & Grönlund, 2012) and largely lack curricular integration (Burston, 2014b). Evaluating apps used in language learning, Rosell-Aguilar (2017) points to their typically limited instructional support, including minimal user feedback, and to help functions which address technical, rather than pedagogical, issues. Poor instructional design is often cited as an issue, with unappealing user interfaces and confusing navigation (Godwin-Jones, 2011; Rosell-Aguilar 2017).

I would argue that while the studies cited above provide a useful overview of MALL, they do not paint a

complete picture of the role that smartphones have been playing in language learning since 2007. One of the reasons is that the studies include a variety of very different devices (e.g., PDAs, feature phones, smartphones, tablets), resulting in a mixing of apples and oranges. A large number of early projects, for example, used SMS for vocabulary learning by sending messages to students periodically with word lists, sample sentences, or study reminders. In the age of smartphone apps, such a teacher-centered approach seems extremely limited pedagogically, compared with the advanced features in mobile apps such as Memrise or Anki. These and similar programs incorporate spaced repetition with intelligent automatic reminders, all-device cloud-based stack synchronization, crowd-sourced graphics mnemonics, and multimedia integration. Creating an SMS project for vocabulary study in an environment today where smartphones are widely used—such as for university students in developed countries—needs to be judged quite differently from such a project created in 2006. In an evaluation of MALL projects, it is crucial to take into consideration the context of use and the timeframe.

A second reason that MALL surveys may not provide a full appreciation of phone-enabled language learning is that for most of the studies analyzed, students were loaned devices. Device ownership can make a world of difference in terms of usage patterns (time on task), motivation, and opportunities for integration into user-installed online services or tools (Kukulska-Hulme, 2009). Owning the device means that it is available for use at any time of the day or night, and in any context or environment. It also means that the user has most likely personalized the device, loading desired apps, customizing settings, and setting up social networks. In the process, the device becomes a trusted companion and must-have daily accessory, playing a role quite different from an institutionally-loaned device.

The third, and most important, reason is that almost all MALL studies address only institutional use of mobile devices (i.e., in formal, instructed language learning). Few examine use outside the classroom. Yet, this is the richest vein of language learning potential, in that students may be engaging in multiple forms of informal learning: incidental (e.g., gameplay), instrumental (e.g., use of a language learning service or app), or accidental (e.g., code-switching in a YouTube video). In any case, those activities will be chosen by the student, not the instructor. This can be a powerful motivator, leading to discovery learning and deeper processing (Oxford et al., 2014). It also offers the possibility of the student integrating language learning into social or professional spheres. These informal opportunities for language learning are likely to happen through apps. This is another distinction that is important to make in considering MALL projects, namely, how the project is packaged and delivered.

It is by no means the case that because a project involves use of a mobile app, that in itself improves its effectiveness. Grouping all apps together and comparing their effectiveness to SMS for language learning (Taraszow, Borghs, & Louris, 2013) does not tell us much, akin to talking about why computers are useful in education. Apps vary tremendously in purpose, scope, and design, and they need to be judged individually. Similarly, smartphone use does not automatically result in more learning. However, I will be arguing that it is not only the hardware and software that have changed, but also the culture surrounding smartphone use today. As Cook, Pachler, and Bachmair (2011) comment, "We understand the mobile phone and other mobile devices to represent the visible tip of the iceberg of a technological and cultural transformation, what we here call the mobile complex" (p. 183). It is above all this mobile complex, not just the new devices, that makes such a difference. The connectivity and personalization afforded by smartphones have led to a volume of use and degree of reliance that we have not seen before in digital devices.

What Has Changed through Smartphones?

iPhones and Android smartphones became available in 2007 and 2008, but there was, of course, no overnight changeover to the new devices. Many individuals and institutions continued to use "dumb" phones or PDAs, and this is reflected in MALL studies. In looking at those projects of the last 10 years, it is important to consider the features of the devices being used and evaluate the project design, goals, and implementation accordingly. This issue was raised five years ago in the pages of this journal in a series of

back-and-forth commentaries by Stockwell and Ballance concerning Stockwell's (2010) article comparing vocabulary learning on mobile devices and personal computers. The discussion centered on whether the project's design (using VocabTutor, an intelligent vocabulary drill program) was "obsolete" in the smartphone era (Ballance, 2012, p. 12). Stockwell (2012) defended the study, indicating that, in fact, the program did adapt to the medium of the phone (redesigned text display and elimination of graphics) and reporting that at the time of his study none of his students (in Japan) owned smartphones. Ballance (2013) followed with a second commentary in which he sketched out a learning app for semantic awareness, using several dynamic, self-evaluating puzzle games. The outlined games took advantage of the touchscreen by using a drag and drop interface, while also providing customizable feedback to the user, who could choose visual, aural, or tactile responses.

Ballance (2013) envisioned the possibility of loading sets of vocabulary into the game dynamically from a cloud-based database. The possibility of drawing resources from remote servers or other Internet services is a powerful component of smartphones. This assumes that network connectivity is available, or that syncing and refreshing can be done when the user re-connects to the Internet. In a vocabulary learning app, this might mean linking up a vocabulary drill or game to a service that allows the user to see the item used in context. In a simple flashcard web app I developed for intermediate German learners, normal functionality is enhanced by linking to sentences illustrating each word in use, pulled from a dual language corpus (Godwin-Jones, 2017). The app includes an import/export function, with the option of loading exported stacks into a full-featured mobile app such as Memrise. There are many more options for enhancing mobile vocabulary learning apps. Location sensors (GPS or Bluetooth beacons) can be utilized to suggest to the user just-in-time, place-based vocabulary and pragmatic behaviors, allowing for and encouraging immediate, real-world usage. The app might detect nearby fellow app users who, depending on status and user proclivity, might engage in online sharing or mentoring. User experiences could be saved to a cloud service, building a personal profile, allowing the app to deliver customized learning. In fact, all these features (and more) are built into the MASELTOV project, through its mobile MApp, offering localized and customized language help to migrants in several European cities (Kukulska-Hulme et al., 2015).

Like MASELTOV, the most successful mobile apps and services feature contextualized learning through an ecological approach (van Lier, 2006; Chun, 2016), or what Hoven & Palalas (2011) term ecological constructivism. Apps can place language and culture learning into a localized setting, while also leveraging the resources of the global network. That makes available both social connectivity and worldwide information sources. In the process, learning content is customized and personalized, allowing the user to integrate new knowledge and skills into a real-world setting. This approach brings into play three major affordances of the mobile complex, which will be discussed here: situated learning, local and global integration, and personal empowerment.

Situated Learning

One of the most powerful affordances of smartphones is situated learning (see Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). Embedding activities and language in real-world environments holds the potential to make learning more meaningful and memorable (Traxler, 2011). The built-in GPS, mapping, and touch control graphics of smartphones allow mobile apps and services to be location-aware and to provide continuous updates as a user moves from place to place. *Geo-fences*, for example, can be created, generating actions such as push notifications when a user enters or exits a defined space (Böhm & Constantine, 2016). The MASELTOV MApp uses *Geo-social radar* to detect whether there are any registered volunteers near the user, available to help migrants with language or culture issues. Place-based learning on mobile devices was possible before smartphones, through the use of RFID tags (radio-frequency identification) and other smart technologies, such as intelligent badges. The LOCH project, for example, involved sending Japanese learners into the community to interact with native speakers in a variety of ways (Ogata et al., 2008). Using tags and sensors, teachers tracked student locations and could send messages and instructions based on locations and interactions. As Byrne and Diem (2014) comment, setting up such

a system is no simple task:

> The downside of these sorts of systems was that they required an IT expert and costly resources to set up. Like PDAs, earlier cell phones, with their limited screen size and cumbersome text inputting, also lacked apps and GPS tracking, which made it extremely difficult for the 'non-IT' expert to set up task-based, context-aware, experiential learning activities. (pp. 4–5)

In contrast, location tracking on smartphones is enabled through built-in features. Cameras can be used to capture images of buildings or landmarks, potentially recognized and described through matching algorithms in programs such as Wikitude. This functionality is enabled through the device being mobile, connected, multimedia-ready, and sufficiently powerful in processing capability to respond to user touch immediately such as image zooming.

Those features have been used in the development of place-based mobile games, particularly through the use of the ARIS game creation platform. To gain an appreciation of the enhanced capabilities of the smartphone ecosystem, it might be of interest to compare two projects, similar in a number of ways: Mentira, a game app for learning Spanish pragmatics in the US (Holden & Sykes, 2011), and an EFL project from Taiwan designed for vocabulary learning and development of pragmatic abilities in English (Tai, 2012). Both featured task-based activities in a game environment. In the EFL project, Chinese students used loaned Windows mobile phones (Internet-enabled) to solve a mystery, namely the identity of a burglar. Students were divided into teams of four and had to collaborate to pool information and to advance in the game. They did that on location at the place where the crime was committed, the Lin Family Mansion and Garden in New Taipei. Since there was an international team investigating the crime, all communication had to be conducted in English. The students interviewed a witness to the crime played by their real-life instructor. They gained information by reading preloaded texts and responses received through texting (using Windows Live Messenger) headquarters maintained by the teacher. Students also had access to preloaded audio and images. They compared images displayed on the phones with the places they saw in the garden, in order to complete assignments. Once they had completed all six tasks, student groups had to synthesize the information gathered and identify the culprit. Students used English extensively in the project, reading and writing text messages, listening to audio recordings, and communicating orally with one another and with their teacher. Pre- and post-tests showed improvement in students' knowledge of targeted vocabulary and sentence structures.

The Mentira project involved university students using loaned or owned iPhone or iPod Touch devices to play a game involving a murder mystery. Students here too had to collaborate to find clues to solve a crime. They did that by playing the game and exploring a Spanish-speaking neighborhood of Albuquerque, NM (Los Greigos). Each player was assigned to a family and had to interact with other virtual family members within the game. In requesting information from them, the students had to phrase their questions in pragmatically correct Spanish, in order to receive useful responses. Each family had different information, so that players had to collaborate to advance their knowledge. While results from game play showed only slight improvement in students' knowledge of specific Spanish pragmatic behaviors, they did demonstrate increased metalinguistic awareness, shown to be potentially as valuable a learning experience as acquiring specific pragmatic constructions (Eslami-Rasekh, 2005).

Both these projects demonstrate creative uses of MALL, and move well beyond the mechanistic drill functionality of many examples of MALL. They also take full advantage of the capabilities of the respective devices being used. Students were engaged in task-based learning, involving completing information gaps, and collaborating or communicating in the target language. However, both the convenient availability of a nearby target language-speaking community and the more advanced capabilities of the mobile devices resulted in several enhanced features of the Mentira project. Student use of Spanish was more authentic, as students were working with real cultural artifacts and native speakers. The more teacher-integrated nature of the EFL project was likely related to the fact that the learners were grade school children rather than university students, but it was also the case that Mentira was more learner-centered. Users had considerable free reign to make choices that had consequences. The game logic evaluated user actions, providing

feedback, updating the user profile, and advancing (or not advancing) the user in the game. This functionality was available through the features enabled by the ARIS platform. ARIS and similar mobile game frameworks, such as TaleBlazer, are possible because of the built-in capabilities that mobile devices have and that support place-based gaming: GPS, cameras, sufficient storage, and processing capabilities. Reflecting the increasing market share of Android devices, ARIS now supports that platform as well. One might lament the market consolidation around just two mobile operating systems, but one of the consequences of the popularity of both iOS and Android is the incentive for app developers to make their products available on both platforms.

Mentira users played the game not only in a supervised environment, but also at home, providing more time on task. As a free app available for download, the gameplay is self-contained. The EFL project used a variety of tools and services on Windows phones, which tended to complicate project set-up and roll-out. Students needed prior training before starting the project. In contrast, although smartphone apps may incorporate a variety of functions, they are designed to be immediately usable with minimal explanation or orientation. MASELTOV's MApp, for example, offers an extensive suite of tools and services within a single app.

The Windows phones used in the EFL project lacked GPS and cameras, meaning that the kind of augmented reality (AR) used in Mentira was not available. In fact, AR has come of age with the advent of smartphones, leading to a significant number of language learning projects using that technology (Godwin-Jones, 2016b). There are increasing numbers of other projects that leverage place-based learning for language and culture learning. The SIMOLA project (Situated Mobile Language Learning) uses a crowd-sourcing approach to allow users to upload contextualized expressions and images from an app (Lingobee), to be shared through a cloud-based service (Petersen, Procter-Legg & Cacchione, 2014). Users are able to customize the expressions, adding items to a personalized multimedia glossary. The MASELTOV project provides context-aware vocabulary and lessons depending on user location. Using AR, users are able to use the TextLens OCR service to capture and translate signs and other print information they might encounter, providing localized information and language learning tips. AR also provides a powerful instrument for combining language and culture. That is the case in the Heritage Trails project in Singapore. As students discover local sites, they practice language skills through the multiple language interfaces available.

The SIMOLA and MASELTOV projects provide examples of incidental language learning, more easily implemented through the smartphone environment (Scanlon et al., 2014). As users go about their daily lives, a learning companion is always available—a kind of personal tutor, available for consultations on demand, somewhat like the companion in Rousseau's *Émile* (1762). Rousseau postulated that Emile's curiosity would not only prompt the child to ask questions, but that information provided in response, since given in a particular context and location, would be retained longer. A series of contextualized learning experiences is the kind of "cognitive apprenticeship" (Brown et al., 1989) smartphones may help develop. A project reported by Bárcena et al. (2015) finds that students engaged in mobile vocabulary learning, "preferred those that enable incidental vocabulary learning as dedicated apps were not seen to be challenging enough, partially because words appeared out of context" (p. 38). Learning through concrete, lived experiences, integrated into everyday life, can provide a powerful instrument for more effective language acquisition.

Local Agency and Global Reach

Smartphones are uniquely equipped to support localized use, while making available all the resources of a global network. One of the seemingly minor but, for linguistic purposes, highly useful innovations of the iPhone was the elimination of the physical keyboard, using instead an on-screen keyboard. While there were initial complaints over the difficulty of typing accurately with fingers, now that screen sizes have grown, and auto-correct algorithms have improved, users have gotten used to this form of text entry. The major benefit has been to make it much easier to support different writing systems. For Chinese, for example, it is possible (and popular) to type in Pinyin, but also supported is drawing Chinese characters with ever-improving recognition. It is not just major writing systems that are supported, but in fact now the

majority of written languages, including, for example, most indigenous languages of India. This has been a boon not just for learners of those languages, but especially for local users, who are able to use their first language to socialize, surf the web, or find employment.

This capability can be instrumental in helping make endangered languages more widely accessible. This is the case, for example, for Native American languages such as Cherokee, for which an iOS keyboard has been developed. After efforts of promoting use of the Chickasaw language through social networks and television, a smartphone app was developed, which according to the *Scientific American*, was instantly popular and has helped launch a revival of the language. Smartphone apps can help in situations where there is a widely distributed population of speakers or learners, as Jones (2015) describes for Welsh. Her account of learners' use of mobile devices for learning or maintaining Welsh offers a nice example of people leading ordinary daily lives reaching out to remote resources, as she catalogs her interviewees' Welsh learning while taking a bath, cooking family meals, or waiting to pick up children from day care.

Having mobile devices support a local language makes them into powerful tools for teaching literacy. In many developing economies, where there is not a fully developed landline phone and Internet system, mobile phones provide voice telephony, text messaging, and Internet access. This is particularly the case in isolated and rural areas, where solar and other alternative power sources can be used. In such environments, or among scattered urban groups, there may be limited access to schools or libraries, so that mobile devices offer a unique opportunity for the delivery of education. Pegrum's *Mobile Learning* (2014) discusses a number of literacy projects featuring mobile devices (see Godwin-Jones, in press). Most use older feature phones. That is likely to continue to be the case in some contexts, but the situation is changing, as inexpensive Android phones, as well as app-enabled feature phones become more widely available and considerably cheaper. This past year, an Android phone model made a splash in India, in that it was full-featured but cost only ₹251 INR (around $4.00 USD).

The cost of the phones is only one factor in affordability, as data plans may still make online access unreachable. However, in many parts of the world, community centers have begun to make Wi-Fi available. While Facebook's plan (Internet.org or Free Basics) was not successful in India in providing free limited Internet access—also promoting free Facebook access—there are likely to be more projects to bring affordable online access to underprivileged or isolated communities, either through national endeavors or NGO efforts. The Stanford Mobile Empowerment Developers Network, for example, has developed pocket schools in South America for indigenous children. The Project ReConnect's idea boxes are easily transportable kits containing a pop-up multimedia center, a satellite Internet connection, and 25 tablets or laptops. They are currently being used to ease re-integration of former FARC combatants in Columbia.

Pegrum's (2014) book emphasizes how important it is for mobile learning projects to adapt to local conditions and cultures. That may mean, for example, in a project in Bangladesh (English in Action) supplementing mobile technology through media more widely available locally. In this case, lessons on mobile devices were supported by information delivered on television or printed in newspapers. In that instance, and in similar projects discussed in Pegrum's book, media such as audio were loaded onto SD cards, which could be inserted into phones. This method could help make learning materials self-contained, so that they could be accessible offline. A more complete delivery mechanism supporting multimedia, as well as web-based interactivity, is to format learning materials into an e-book. This allows the content to be downloaded once, and then be available offline. If content is in HTML5 format, it can be easily packaged as an EPUB 3 zip file, which will work in e-readers on mobile or desktop devices (see Godwin-Jones, 2014a). The EduPub project from IMS Global is adding LTI (Learning Tools Interoperability) functionality to e-books, so as to connect student access data or assessment results to a learning management system or other cloud-based service. If work is done offline, new data is automatically sent once the user reconnects.

This functionality is emblematic of the ways in which smartphone users, from virtually any connected location, hold the power to connect interactively to a wide array of educational opportunities. This is an invaluable tool for enabling educational services in far-flung locations and supporting distance learning, but it also offers face-to-face instruction a means for students to learn on the go wherever they may be.

Personal Empowerment

Every smartphone is configured differently, customized as to language and locale, and loaded with apps of the user's choosing. One of the difficulties in being able to measure the efficacy of MALL projects is that the typical student will have access to and be using daily a variety of online tools and services. Some may be in the target language (foreign newspapers or TV stations) or be designed for language study, ranging from basic tools such as dual-language dictionaries to sophisticated services such as Babbel or Duolingo. The extent to which language learners take advantage of such resources will vary with the individual and the context of learning. It would be helpful to students in instructed language learning to be provided some guidance on different online tools and services for learning the target language. How often that occurs is difficult to gauge, but I imagine that most language teachers do not routinely discuss the use of mobile apps or, as would be most helpful, demonstrate their use in the classroom. Yet, that is the kind of information students will need for language maintenance and future language study.

Many teachers are likely motivated to move in the opposite direction, banning the use of phones in the classroom (see Cook et al., 2011; Leis, Tohei & Cooke, 2015; Park & Slater, 2014). As Van Praag and Sanchez (2015) comment, such practices run counter to the professed beliefs of most teachers in the use of constructivist-oriented teaching and learning. If we want students to use all available means to build and synthesize knowledge, it does not seem sensible to cut off such a key avenue of information retrieval. This makes the classroom into an even more unreal environment, where language learning is an artificial enterprise, serving as potential practice for the real world, but not actually part of that world. Banning phones from the language classroom discourages the notion that language acquisition is something students can integrate directly into their lives, with the smartphone helping to bridge the gap between school and life. Studies have shown that use of phones for learning in the classroom can lead to more use of phone-mediated learning outside school (Byrne & Diem, 2014; Leis et al., 2015). There is evidence as well that students, though digital natives, need and value the advice and guidance from teachers in terms of online language learning tools and services (Palalas, 2011; Hubbard, 2013).

Ideally, we want students to incorporate language awareness and learning into their everyday lives. One of the shifts made possible and popular through smartphones is the growing role of visual media in online communication. Students are likely to use Instagram, Snapchat, and other apps to share photos and short videos. They are probably heavy consumers of YouTube as well. Today, smartphones enable creation, editing, and sharing of media artifacts, something that can be leveraged for language learning. Leis et al. (2015) had students shoot video of themselves play-acting scenes in the target language, which were then shared and discussed online. Talaván and Ávila-Cabrera (2015) developed a mobile application that used video clips played on smartphones to improve listening comprehension. Moreno and Vermeulen (2015) used an innovative approach to working with mobile videos, having students create audio descriptions of scenes. Audio has been used for some time on mobile devices, with podcasting often evoked in MALL studies, while student creation of audio diaries, narrated tours, and digital stories has not been used to potential. Structured speaking practice is less often seen, although with improvements in automatic speech recognition, we are seeing its use in enabling pronunciation practice, as in Liakin, Cardoso, and Liakina (2015). The audio and video recording capabilities make smartphones ideal tools for use in projects involving study abroad or other place-based cultural activities (see Godwin-Jones, 2016a).

Having students create and share media can have an empowering effect on students, handing them ownership and control over aspects of their learning (Laurillard, 2007). Palalas (2011) reported that having students share annotated photos provided a sense of pride and accomplishment. Chang, Chang, and Shih (2016) found that connecting students with one another while working on online learning tasks made students feel less isolated and more motivated. Enhanced motivation was also listed as an outcome of students using an interconnected and place-based vocabulary learning app (Huang, Yang, Chiang, & Su, 2016).

While language learning may not be an issue of central importance in the lives of many of our students, learning a second language, along with the cultural framework that comes with it, is a matter of crucial

importance to one population: migrants and refugees. For these groups, mobile phones are a powerful instrument in potentially life-changing (or life-threatening) situations, as reported by the European Union Institute for Security Studies:

> Migrants are linking up online to cross borders and meet their basic needs. They are using smartphones to share tips and geo-positional data as they cross North Africa. They rank and rate Afghan people-smugglers, trying to hold the criminals accountable for the safe transport of family members. On Google they share tips, such as to avoid exploitative Istanbul taxi drivers or evade new EU border controls. (Parkes, 2016, p. 1)

The kind of device that migrants use will vary with the individual and place of origin. One account has shown that of young Syrian refugees, 86% owned a smartphone (Parkes, 2016). A number of mobile apps have been developed by NGOs and government agencies to help migrants in a variety of areas, including language learning, cultural integration, and practical day-to-day living. Some apps aid in the process of migrants making their way through intermediate countries to their final destination. InfoAid helps refugees in Hungary, while Gherbtna is aimed at Syrians newly arrived in Turkey. The Mobile Legal Info Source helps navigate Turkey's legal system. The Crisis Info Hub offers support for new arrivals in Greece.

In Germany, the hoped-for destination of many refugees, a number of apps have been created targeting the immigrant population. The Goethe Institute, along with federal agencies dealing with immigration and employment, have created Ankommen (*Arrival*), available in Arabic, English, Farsi, French, and German. As do other such apps, it is designed with minimal technical requirements, so as to be usable on older phones. It features three branched areas: German language study, German asylum procedures, and tips on living in Germany. Integreat offers a similar service for refugees in Germany. It is available in five languages and features information specific to one of the 80 German cities targeted. Daheim (*At Home*) offers a meeting platform for new arrivals and German natives, designed for language learning and intercultural exchange. The ReDi School of Digital Integration in Berlin is developing Bureaucrazy to help refugees make their way through German bureaucracy, featuring language help and practical information on filling out forms in German. The school also has started a program teaching refugees how to code and create mobile apps.

In fact, we are starting to see a number of initiatives for learning to code on mobile devices. One of the most prominent is Swift Playgrounds from Apple, designed for creating apps on iPads. The playgrounds take advantage of the touch interface of mobile devices, offering a new coding keyboard and a pop-over keypad for in-place editing. One can drag from a library of coding snippets to create new code or drag the boundaries of a loop or function definition to wrap around existing code. A number of other initiatives offer opportunities for learning and practicing writing code on mobile devices. The Hour of Code project for tablets provides tutorials and online learning sessions in 45 languages. The Code School offers tutorials for learning multiple computer languages. There are a good number of other initiatives for learning to program through mobile devices, including sololearn, mimo, lrn, and enki.

Such resources for professional or personal development extend widely educational networks. In this case, anyone seeking training to become a programmer, with no courses of study available locally, can use online resources without the need for wired desktop computing. Many MOOCs (massive open online courses) target areas of computing and programming and have improved in recent years in their ability to tailor instruction to delivery on mobile devices (Godwin-Jones, 2014b). This same kind of distribution system is available for language learning.

Conclusion and Outlook

Smartphones do not seem likely to be going away anytime in the foreseeable future. While the pace of innovation has slowed, new features will continue to be added as the devices become thinner but more powerful. As inexpensive smartphone models proliferate, feature phones have been forced to add features formally found only on expensive smartphones. This should enable the spread of smartphone-like

capabilities to more communities. This, in turn, will encourage further development of mobile-enabled literacy projects and language learning applications. Language learners will continue to use regular commercial apps for socially based or incidental language learning, while taking advantage of utility apps for translation and dictionary look-ups.

As mobile learning proliferates informally, it will make more headroom in the classroom as well. Instructors and researchers are likely to engage in more MALL projects, including creation of apps. That will increase interest in finding ways to evaluate different approaches to mobile learning. This is no easy task, not only because it is difficult to isolate the benefits provided by a particular app among other mobile apps and services, but also because tools and services do not generally limit themselves to one delivery method, mobile or desktop. Indeed, some iOS apps now feature phone, tablet, and watch versions. Web apps can be used on mobile devices, but just as well on desktop computers (Godwin-Jones, 2011). One development which tends to blur the distinction between sites or services directed at desktop browsers and mobile devices is the widespread use of responsive design. This involves using CSS and JavaScript to create webpages or web apps which automatically adjust to screen size. A number of frameworks (code libraries) are available for automating that process, including Bootstrap, ink, and susy.

There have been several efforts to create an evaluative framework for apps and mobile language learning projects. Martín Monje, Arús-Hita, Rodríguez-Arancón, and Calle-Martínez (2014) and Moreno and Traxler (2016) propose evaluative systems which link mobile apps to CEFR standards (Common European Framework of Reference for Languages). Zervas and Sampson (2014) outline a framework with which to categorize (as well as to adapt) OER for mobile use. Reinders and Pegrum (2015) recommend an approach that focuses on effective learning design, proposing to examine the extent to which MALL applications correspond to general pedagogical principles, with specific attention to L2 learning and accepted SLA theories. They list an additional category, affective principles, which counts less than the others in their scoring system. While I agree that effective learning design is of paramount importance, I would argue that, particularly for mobile users, designing for enhanced motivation and relevance is an important factor, given the desire to have students continue learning beyond the formal institutional setting.

Rosell-Aguilar (2017) points out that many apps are designed for a very specific purpose and may not meet all the criteria in a checklist, yet still present a valuable learning opportunity. It is not necessarily the case, as Rosell-Aguilar points out, that the more criteria an app meets, the better it is. He provides evaluative frameworks for different kinds of apps, considering separately apps designed for language learning (e.g., HelloTalk or Rosetta Stone), general apps usable for language learning (writing, podcasts, texting, flashcards, reading), and dictionary or translator apps. For apps intended for language learning, the author suggests four overriding criteria: technology and design, pedagogy, user experience, and language learning potential. Rosell-Aguilar suggests presenting the criteria in class for discussion and walking students through the evaluation process. This could provide help for training students not only in finding and using apps for target language study, but as well in gaining more insight into learning design, helpful for evaluating resources in other contexts.

The kind of classroom training advocated by Rosell-Aguilar (2017) is only going to happen if teachers value the use of portable devices for language learning. Teachers are likely to have differing views on student versus teacher use of mobile devices in education:

> For educators, it is relatively easy to imagine learners receiving some content on their mobile device, even if personally they would find it difficult to interact with such content on a tiny screen and in circumstances that they do not associate with learning. What is more difficult is imagining a whole scenario of learning that goes beyond established practices within the classroom. (Kukulska-Hulme, 2009, p. 161)

Moreno and Traxler (2016) point out that teachers tend to favor pedagogical approaches they themselves encountered in their education. They therefore propose a mobile-delivered MOOC for language teachers. This might help them rethink the use of MALL activities. Having teachers themselves engage in actual

learning with mobile devices is likely necessary to effect change.

Rosell-Aguilar (2017) suggests several areas that would benefit from further research. One important area is to look beyond mobile device use in the classroom toward an examination of how learners engage in mobile learning in the wild. This might involve looking at combinations of apps that are effective or at which apps can most effectively support different skills (sometimes beyond the stated intended use). Important as well are examples of how mobile-based informal learning can be integrated into instructed language learning. Useful too would be more longitudinal studies, following students' language learning through time, with an examination of mobile and other tool and services used. Actual language gains through mobile app use is difficult to measure and research. For that reason, qualitative studies that present case studies would be particularly welcome.

Palalas (2011) and Hoven and Palalas (2011) provide an example of iterative MALL development, using design-based research in a project which morphed from a simple podcasting app into a networked community of practice. The project evolved in response to student feedback and through a collaborative process between researchers and practitioners. Similarly, Wong, Chai, Aw, and King (2015) used design-based research to adapt a mobile app to student perceptions and experiences, moving through several cycles of development. This process also included using the smartphone app to re-contextualize vocabulary learning in a Chinese learning environment which tended to stress memorization and repetition. Students engaged in shared photo-blogging through a social networking space in the app, creating artifacts on the fly and making meaning in situ. Through the app, students underwent an enculturation process, designed to change their beliefs and habits in regard to learning. This kind of change is an important factor in helping students become autonomous language learners. In that vein, studies that profile how students learn independently and self-regulate their learning in different contexts and on different devices would be welcome. A part of what we might learn from such studies could be information on learners' time management and usage patterns related to mobile learning.

More data might shed light on an issue often raised, namely whether mobile learning, with its short bursts of activity, leads to fleeting and superficial engagement or whether there is some degree of deeper learning present despite the fragmentation (see Stockwell, 2010). This was recognized as an issue in the MASELTOV project: "A related challenge is to help the target audience reconceptualise fragmented problem-based learning episodes into longer-term learning journeys with more abstract trajectories, which we believe is likely to be facilitated by encouraging personal goal setting and reflection on learning" (Kukulska-Hulme et al., 2015, p. 17). Providing channels for discussion and sharing can be instrumental in helping students synthesize and verbalize their learning experiences. To provide opportunities for interaction and reflection, the MASELTOV project created online forums and a Facebook group. For independent learners, this kind of support remains a challenge. That is likely part of the reason we are seeing significant interest in services such as Duolingo or Busuu, which offer peer support networks and game-like achievement rewards.

While smartphones have clearly moved from the category of fun toys to that of powerful pocket computers, it is no easy task to harness the computing, communication, and collaboration capabilities for the purpose of serious learning. For instructed language learning, the mobile complex, developed around the smartphone, provides both challenges and opportunities. The main challenge is to provide to students the skills and knowledge to be informed and engaged online learners. Important in that process is presenting persuasive illustrations of learning connected to students' lives (present and future) and to bring those experiences into the classroom. The most effective way to do that may be through the smartphone they likely all own. The opportunity is to leverage those digital devices and online experiences to enable and encourage in our students life-long learning, learner autonomy, and critical digital literacy.

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