



Some Emerging Principles for Mobile-assisted Language Learning

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Executive Summary

The steadily increasing access to sophisticated but affordable portable technologies over the past several years has brought with it a body of research into using these technologies for learning in both formal and informal contexts. It is not surprising, then, that language teachers have also adopted mobile technologies into their individual teaching and learning contexts. This paper first examines recent studies from the mobile-assisted language learning (MALL) literature, exploring the issues that emerge from this body of research through a framework distinguishing physical, pedagogical, and psycho-social dimensions. Recognizing not only the contributions but also the limitations of existing MALL literature, it then identifies a number of findings from the closely allied fields of mobile learning (ML) and computer-assisted language learning (CALL) that can inform both research and practice in MALL. Drawing from all three sources (MALL, ML, and CALL), the paper proposes ten general principles to guide teachers, learners, administrators, employers, and other stakeholders in the challenge of effectively integrating mobile devices and tasks into language learning environments. The paper concludes with a case study showing how each of the principles described have been applied in an actual mobile language learning context.

Focus of this Paper

Mobile-assisted language learning (MALL) has developed over the past decade as a sophisticated field within its own right, with an increasing number of articles that examine various mobile devices used in environments both inside and outside of formal language learning situations. MALL has been defined as the use of “mobile technologies in language learning, especially in situations where device portability offers specific advantages” (Kukulska-Hulme, 2013, p. 3701). MALL includes devices ranging from MP3/MP4 players, smart phones, and e-book readers through to laptop and tablet computers. There has been a surprisingly large amount of research published over the past two decades that has seen the field develop along with the enormous steps forward that have taken place in mobile technologies. (See Burston, 2013, for an expansive annotated bibliography of MALL from 1994-2012.)

This paper begins by investigating some of the possible generalizations that may be seen from current studies into MALL from the viewpoint of physical, pedagogical, and psycho-social considerations. It then considers the existing body of research into both mobile learning (ML) and computer-assisted language learning (CALL), and examines how insights from these two fields can inform MALL research and practice. Based on the literature from MALL, ML, and CALL, the paper proposes ten general principles for the design and implementation of mobile applications as well as tasks using native mobile functionalities. It concludes with a description of an actual mobile language learning implementation that considers each of the principles described.

Key Issues and Insights from Mobile-assisted Language Learning

Mobile language learning is a field that is quickly maturing, and to this end, a growing body of research has appeared that highlights the various ways in which mobile devices may be used in the teaching and learning of languages. Research has for the most part shed a very positive light on the potential of the role that mobile devices may play. At the same time, however, there has also been indication of several areas that certainly deserve consideration in their implementation. In an effort to characterize MALL coherently, we look at it from the



perspective of a framework dividing the relevant issues across three domains: physical, pedagogical, and psycho-social. Although there are points that are clearly relevant to each issue, these categories do not exist separately from one another; rather, they are necessarily interrelated and overlapping.

Physical Issues

By the very nature of mobile language learning, the devices that are used are portable and relatively small. While it is precisely these characteristics — along with the wide range of functionalities that modern mobile devices now possess — that contribute to these devices being carried by learners, they also have the potential to limit the ways in which the devices are used. Given that the bulk of recent research into mobile language learning relates to MP3 players (e.g., Ducate & Lomicka, 2009), mobile phones (e.g., Browne & Culligan, 2008), or Personal Digital Assistants (PDAs) (Huang & Lin, 2011), it is not surprising that the most widely cited physical issues relate to the screen size and the methods of inputting (Thornton & Houser, 2001; Stockwell, 2008). Additionally, other issues such as storage capacity, processor speed, battery life, and compatibility of devices (in terms of both operating systems and transfer of large amounts of data) have also been raised as points needing consideration in implementing mobile devices in learning contexts (see Koole, 2009).

While mobile phones have typically been the device of choice for many learners in recent years, other devices such as tablet computers are also gaining popularity. (See Fujimoto, 2012, for an Australian example.) Research into the use of such devices for language learning, however, still appears to be lagging behind that of the smaller devices, with only a handful of studies being carried out thus far (e.g., Lan, Sung, & Chang, 2007; Brown, Castellano, Hughes, & Worth, 2012). Thus, while research on larger portable devices is still sparse, we can expect it to expand as tablet use in particular becomes more widespread.

Pedagogical Issues

One of the greatest challenges with mobile learning is to ensure that tasks are suited to the affordances of the devices used. In much of the early research into CALL, there was a tendency to see activities that were originally designed for pen and paper to be transferred essentially as is. Thus, in many cases, early developers and practitioners did not take advantage of the potential interactivity afforded by computers (cf., Levy, 1997). What we are tending to see with mobile devices is that many activities simply fall into the same trap of what came beforehand. Computer-based activities are essentially replicated without adequate consideration of the specific affordances of mobility. (See Godwin-Jones, 2011, for a discussion).

There have been a number of attempts to use specific functions of mobile devices in language teaching and learning environments. Gromik (2012), for example, required Japanese learners to use the video recording function of their mobile phones to produce short English monologues. He found that the learners were able to make increasingly longer videos over time. In another study, Sandberg, Maris, and de Geus (2011) provided young Dutch learners with mobile phones equipped with GPS capabilities in order to help them learn English vocabulary. The learners negotiated their way around a zoo and completed a number of games based on the different animals around the zoo. Using yet another function of mobile phones, Rivers (2009) required Japanese learners of English to scan QR (Quick Response) codes that were posted around the university in order to complete several information exchange tasks. QR codes are graphics that enable the phones to automatically link to online information. This



brief list provides some indication of the innovative ways in which mobile devices can be used for language learning that go beyond simple replication of paper-based or even computer-based learning materials.

An additional feature that mobile devices appear to be suited for is that of what has come to be known as push and pull mechanisms (see Stockwell, 2013, for a discussion). As Motiwalla (2007) describes, the pull mechanism is what is more typically associated with the type of learning that may be seen through more traditional CALL, where the onus to access learning materials lies with the learners themselves. In contrast, the push mechanism “pushes” information on to the learners, typically in the format of a text message sent directly to them through a mobile phone’s existing SMS (Short Message System) tool (e.g., Kennedy & Levy, 2008) or some other communication application, such as *WhatsApp* (e.g., Gutierrez-Colon Plana, Gimeno, Appel, Hopkins, Gibert & Triana, 2013). The pedagogical potential of the push mechanism is still being examined, but there has already been preliminary evidence (Stockwell, 2013) that pushing the learner into action — albeit not always immediate — can add a new dimension to the learning process that can shape how learning through mobile devices takes place.

Research has indicated that learners are not necessarily as competent in using the range of functionality mobile devices offer as the so-called “digital natives” concept (Prensky, 2001) may suggest. Knowledge of how to use mobile devices for specific personal or social functions is not always a good indicator of knowledge of educational functions. For example, Abdous, Camarena, and Facer (2009) found that, despite owning mobile technologies, only a small number of learners opted to listen to podcasts for learning languages through their mobile devices, a primary reason being that they did not know how to download the podcasts to their devices. As has already been made clear from work in CALL (see the discussion below), learners need assistance in using tools effectively, and this point is also applicable to mobile learning environments.

Psycho-social Issues

Mobile devices have certain features that distinguish them from many of the technologies that preceded them. Perhaps the largest distinction is the fact that unlike desktop — or even early laptop — computers, the primary function of mobile devices has been for personal and/or social purposes, as opposed to work or study purposes. When looking at the various applications installed on these devices, certainly almost without fail there will be applications for communication with others, either individually or in a group, such as LINE, Twitter, or Facebook. There is also a large range of games available for most mobile platforms these days, and the number of downloads of such games is steadily increasing (Schroeder, 2011). The existence of such a range of personal and social applications implies that learners may not perceive their mobile devices as appropriate vehicles for learning.

Indeed, results regarding learner perceptions of social networking tools for language learning have been somewhat mixed. While Mok (2012), for example, has suggested that learners embrace social networking service (SNS) sites to interact in the target language, other researchers have indicated that learners express reservations. Research by Alm (2013) and Chen (2013) has provided evidence that learners are actually quite aware of their audience in communication that occurs through social networking sites, and will often opt to not use the target language for fear of not being understood by others in their communities. In related research, Liu (2013) argued that a number of English learners in Taiwan only agreed to

participate in projects using Facebook if they were able to use an alternative account to their private account. However, they ultimately rarely used the new account, as they found it cumbersome to log into separate accounts for the activities that they were required to undertake as part of their English studies. Thus, many learners seem to draw a clear line between private and learning purposes with their mobile devices (see Stockwell, 2010, for a discussion). Simply owning the device — or even the software or app — may not necessarily be an indication that they will automatically choose to use it for learning purposes, particularly when there is a link between that use and their online identity.

Key Issues and Insights from Mobile Learning and CALL

We have seen that there is a growing body of literature on mobile language learning and have described a three-part framework specifically devoted to it. We hope this perspective can aid researchers, developers, and practitioners in interpreting and applying the results of that literature as well as promote additional research and development. However, it is important to recognize that this field is not a fully independent one. Besides its obvious relation to second language acquisition (SLA), there are two major bodies of knowledge that we can draw on for guidance: mobile learning in general and computer-assisted language learning. Based on the already-rich referencing of ML and CALL works that has occurred in MALL studies, we offer the Venn diagram in Figure 1 as a simple illustration of our conception of the cross-field relationships.

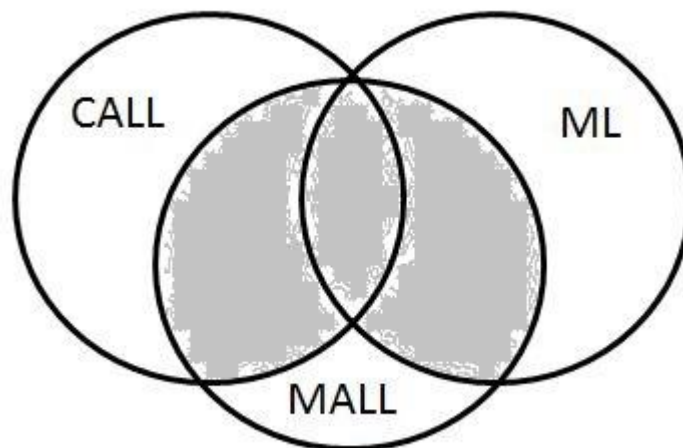


Figure 1. The relationship of computer-assisted language learning (CALL), mobile-assisted language learning (MALL), and mobile learning (ML). The shaded area represents the overlap.

We believe that Figure 1 captures an important characteristic of mobile language learning: although MALL is no doubt in some ways unique, the research, insights, and experiences from its cognate disciplines of CALL and other domains of mobile learning provide valuable, perhaps even crucial, inputs to the field. Put another way, MALL has so much in common with CALL and ML that it is best understood as mostly belonging to both disciplines rather than being set apart from them (though note that the figure incorporates a “MALL-specific” region as well). In the remainder of this section, we will provide some examples of relevant generalizations



drawn from the ML and CALL literature, combining them with those from MALL studies to derive a set of principles for mobile language learning.

There are a number of generalizations found in mobile learning literature that are important regardless of the content area focus. Herrington, Herrington, and Mantei (2009) present 11 general design principles for mobile learning, and several seem especially relevant to language learning. These include providing time for exploration of mobile technologies, blending mobile and non-mobile technologies, using mobile learning both individually and collaboratively, and employing the learners' own mobile devices (Herrington *et al.*, 2009, p. 134). Building on her previous work in distance education, Elias (2011) reviews eight universal design principles and interprets them for mobile learning. Four of these principles are clearly of value to MALL:

- equitable use, "deliver content in the simplest possible format;"
- flexible use, "package content in small chunks;"
- tolerance for error "scaffold and support situated learning methods;"
- instructional climate, "push regular reminders, quizzes, and questions to students" (Elias, 2011, p. 148). (See also Browne & Culligan, 2008.)

In addition to the general literature on mobile learning, there are several areas of research and methodology from the broader field of CALL that are relevant for mobile language learning. Some of these involve extensions of SLA and more general learning theory, research, and practice to the technology domain, while others have come directly from CALL experiences. Those conducting research or attempting to implement mobile learning solutions would be well advised to review the rich literature in CALL.

There is a tendency in implementing mobile solutions, both broadly and locally, to sometimes uncritically focus on technology affordances. Among the affordances for technology in language learning that are particularly relevant to mobile environments are access, authenticity, and situated learning (Reinders & White, 2010). However, these affordances are accompanied by challenges and limitations. For example, while mobile learning allows anytime/anywhere access, the learning experience on mobile devices may be degraded by a number of factors such as "limited screen size...and the often distracting environments in which they are used" (Reinders & Hubbard, 2013, p. 366).

As MALL often involves the use of personal communication devices, one element that seems particularly relevant is the carryover of the technology practices from the personal/social domain to that of language education. Indeed, as described above, there is a tendency to assume that existing personal uses will transfer seamlessly to educational uses. Thorne (2003) captured this concept handily with the term "cultures of use" (p. 38). Operating within a sociocultural framework, he described the impact of learners' existing usage patterns and attitudes toward technology applications in language learning tasks. In one such example, a US student and a French student working on a tandem CMC task spontaneously shifted from email to the more familiar instant messaging format, and became far more engaged in the process. Another area involves the recognition that the mobile environment is often, though not exclusively, an online environment. Thus, in devising tasks, it is useful to draw on guidelines such as those from Doughty and Long (2003), who synthesized 10 principles for online task-based learning from SLA literature. Another worthwhile source is Chapelle (2001), who drew largely from the interactionist account of SLA to construct her framework of five principles for judgmental and empirical evaluation of CALL tasks. The most fundamental of these principles was "language learning potential," a particularly relevant issue for MALL.



Several important insights about the use of technology in language learning are broader and less attached to particular theoretical positions. Among the more useful for the MALL discussion are the recognition of individual and group differences, considerations for collaborative learning and the limitations of self-report in surveys, questionnaires, etc. The novelty effect during early uses and the importance of both learner and teacher preparation for effective utilization are also worth noting.

A number of CALL studies have recognized individual differences in learners. Heift (2002), for example, developed a descriptive framework to categorize the interaction patterns of language learners with grammar-focused intelligent CALL software for teaching German. Looking at how the learners utilized help options, she found them clustering into distinct groups she labeled *browsers*, *peekers*, and *adamants*. Adamants, for instance, would continue attempting to answer a task question repeatedly rather than giving up and being shown the answer. Beyond the individual, proponents of MALL often stress the affordances of these devices and environments for collaborative learning (Herrington *et al.*, 2009). However, collaboration cannot simply be mandated. A number of CALL studies have shown that beyond the technological arena (where diversity in knowledge and skills clearly exists), there are cultural and individual differences that play into the success or failure of collaborative groups (e.g., Belz, 2001).

Another difference is found between what learners say (and perhaps believe) they do and what detailed tracking software actually shows. Fischer (2007) demonstrated this point convincingly with a detailed comparison of self-report vs. tracking data. Thus, when evaluating a MALL application or task, it is important to supplement surveys and questionnaires with more objective measures whenever possible. Nielson (2011) similarly showed the difference, between intentions and following through, in learning tasks. In one workplace-centered study, motivated volunteers from several US government agencies were given the opportunity to learn new languages using a popular commercial product (Rosetta Stone). Of 150 volunteers, less than half even accessed their accounts to begin study, only about 21 completed the first 50 hours, and only one completed the final assessment of the course.

A number of studies in CALL have noted the potential impact of the novelty effect or the “Wow factor” (Murray & Barnes, 1998), during initial use for both teachers and students. In a longitudinal study of 15 email messages by advanced learners of Japanese to Japanese native speakers sent over five weeks, Stockwell and Harrington (2003) noted a pronounced “first-message effect”, where the initial email was richer and more elaborate compared to the next few. Thus research touting positive results on first use needs to be interpreted as tentative at best.

An important area of consideration for any new technology implementation is the user’s readiness to employ it effectively. There are two complementary areas for this view: teacher education and learner training. Teachers planning to incorporate technology into their curricula need technological pedagogical content knowledge (AACTE, 2008). For language teachers, such knowledge entails both technological and pedagogical skills and knowledge specifically for their discipline (Hubbard & Levy, 2006). Wong and Benson (2006) show that a single training course alone is not enough for some. In a case study contrasting two in-service teachers following the same CALL course, they found significant differences in the teachers’ subsequent integration of technology in their classrooms. The degree to which teachers will appropriate mobile technology and the quality of learning that will result will depend on a



variety of factors. We can anticipate that many learners working with MALL tasks or applications will similarly need focused training in order to use even familiar technology (such as their own mobile devices) effectively for language learning (Hubbard, 2004, 2005; Winke & Goertler, 2008; Winke, Goertler, & Amuzie, 2010).

Ten Principles for Mobile Language Learning

It is still very early in the development of mobile language learning, and the rapid shifts of the past decade in terms of devices, communication options, the rise of apps, and social networking make it a challenge to offer guidance. Additionally, the promise of innovations involving location-based learning (Kukulska-Hulme, 2013) and augmented reality underline the volatility of the field. Nevertheless there is a need to build upon the research results and reflective reports from CALL, mobile learning, and MALL itself, in order to limit the repetition of errors and omissions with each new iteration of products, and to maximize its benefits. Based on the preceding discussion incorporating elements of physical, pedagogical, and psycho-social dimensions and drawing on additional literature from multiple sources, we offer the following 10 principles as an initial basis for developing and implementing mobile language learning. It should be noted that these are meant to be relatively neutral with respect to pedagogical approach: They are likely to be applied in different ways, for example, by those holding sociocultural vs. interactionist positions (Mitchell, Myles, & Marsden, 2013).

We have deliberately left out design criteria such as “authenticity”, despite its popularity in both CALL evaluation schemes (e.g., Chapelle, 2001) and general mobile learning frameworks (e.g., Herrington *et al.*, 2009). Clearly, widely used apps such as those for vocabulary rarely present authentic tasks or settings yet they currently play a substantial role in the mobile language learning domain. The 10 principles below focus instead on more general lessons learned from implementing technology applications. As such, they should be complemented by additional guidelines from the specific language teaching and learning approaches employed by the users.

Principle 1. Mobile activities, tasks, and apps should distinguish both 1) the affordances and limitations of the mobile device and 2) the affordances and limitations of the environment in which the device will be used in light of the learning target (Herrington *et al.*, 2009; Reinders & Hubbard, 2013). Crucially, if the fundamental goal is language learning, then these affordances and limitations should be directly connected in a principled way to second language learning research and theory (Chapelle, 2001; Doughty & Long, 2003).

Principle 2. Limit multi-tasking and environmental distractions. Mobile environments, such as when commuting, by their nature are likely to be distracting, and multi-tasking is a natural part of that environment. We have increasing data that most people, including so-called digital natives, are not good at multi-tasking (Ophir, Nass, & Wagner, 2009) and that it raises stress levels, increases error rates, and lowers productivity. As a result, it interferes with both deliberate and incidental language learning in both educational and workplace settings.

Principle 3. Push, but respect boundaries. Research has shown that the push mechanism has the potential to prompt learners to action (e.g., Stockwell, 2013), but at the same time, learners have ideas of when and how frequently they would like to receive these reminders (Kennedy & Levy, 2008). Assuming learners are constantly connected with their mobile devices, it is possible to send content, activities, or simply reminders to learners regularly. These messages have the potential to shift attention to the learning task. However,



they can also interrupt other more or equally valid activities, particularly in the workplace. A recommendation is to allow the user some control over when these push events occur, and to plan them for particular times to allow the learner to plan to accommodate them.

Principle 4. Strive to maintain equity (Elias, 2011; Herrington *et al.*, 2009). In a classroom or other formal language learning setting, important issues to be sensitive to include whether the learner has a mobile device, what device the learner has in terms of compatibility and functionality, how consistent device connectivity is, and what the expense is for using that device for the planned operation. Reasonably equivalent non-mobile alternatives should be available if an inequity is apparent.

Principle 5. Acknowledge and plan for accommodating language learner differences. As with other types of technology implementations, mobile learning should take into account a range of learning styles (Chun, 2001; Heift, 2002) as well as differences in comfort levels for learning in a public vs. a private space. For mobile devices, access issues such as visual acuity and manual dexterity for smaller keypads and touchscreens are also prominent concerns.

Principle 6. Be aware of language learners' existing uses and cultures of use (Thorne, 2003) for their devices. Studies have shown that students may perceive their mobile devices as being for personal and social use rather than as educational tools (Liu, 2013; Stockwell, 2010). Some mobile applications may require developing new skills, but the more consistent a task or app is with existing uses, the more readily learners will likely accept it.

Principle 7. Keep mobile language learning activities and tasks short and succinct when possible. As a corollary, divide longer tasks or activities into smaller, coherent chunks. This point is standard advice from other mobile learning frameworks (Elias, 2011; Herrington *et al.*, 2009). Interruptions, which will occur predictably in many mobile environments, should trigger as little backtracking as possible when students are returning to the task.

Principle 8. Let the language learning task fit the technology and environment, and let the technology and environment fit the task. If the assumption is that learners will be using a mobile phone at short intervals during the day (e.g., "dead time" between classes or other activities) in settings where it may be difficult to incorporate sound, then tasks should be developed that fit that technology and environment and still allow effective learning. If the assumption is that learners will be engaged in a task that requires longer chunks of time (20-30 minutes) and necessitates reading substantial text or other visuals from the screen and typing in short responses to questions, then appropriate technology (larger smartphones or tablets) and a more contemplative environment (e.g., library, classroom, or students' homes) would be called for. As Kukulska-Hulme (2013) notes, the mobility of the learner as well as of the technology must be considered.

Principle 9. Some, possibly most, learners will need guidance and training to effectively use mobile devices for language learning. Hubbard (2013) makes a case for learner training in other domains of CALL, and there is no reason to believe that mobile language learning will be exempt from these challenges. Most of the preceding principles incorporate elements that are controlled by learners — teachers and developers may acknowledge them, but ultimately the implementation is in the hands of the mobile user. Learners unaware of the negative impact of multitasking or the environment in which they are using mobile devices, for example, need to be informed and trained in making their use as efficient as possible. Although the devices may claim to be intuitive, using them for language learning is not. Similarly, the literature from CALL



on collaborative learning supports the idea that training for collaboration may be beneficial (Hampel, 2009).

Principle 10. Recognize and accommodate multiple stakeholders. In the language classroom setting, adequate preparation and motivational support for teachers as well as learners must be provided. In the workplace, the impact of the potential ubiquity of mobile learning on co-workers, supervisors, and productivity in general should be considered, especially as it relates to Principle 2 above. Within both educational and workplace environments, mobile language learning is just one type of mobile learning that is likely to be occurring. There is potential for positive carryover from one learning domain to another, but also conflict as the needs for content learning and language learning merge or clash.

Pedagogical Implementation

A study exemplifying how these MALL principles can be incorporated in practice was carried out by the first author with pre-intermediate EFL students in a private university in Japan in early 2013. Due to space limitations, the description here is limited to describing how the principles described above may be applied to an actual language learning environment. Activities were created to allow learners to study vocabulary which appeared in a series of authentic videos. These videos comprised the primary teaching materials used in class, and the vocabulary activities consisted of short multiple-choice questions, vocabulary matching questions, and gap-filling questions that could be accessed through a webapp or a web browser. In line with Principle 5, learners were given the option of using either their mobile phones or desktop computers (PCs) to complete the activities, because previous research (cf., Stockwell, 2008) has revealed that learners will often opt to use a PC to complete these activities rather than their mobile phones.

While most of the students had smart phones of varying makes and operating systems, a small number were using pre-smart phones (phones with internet data connection but not app capabilities), meaning that three different types of interfaces needed to be designed: a desktop version, a smart phone version, and a pre-smart phone version (Principle 4). Learners indicated that they were frequent users of their mobile phones, and undertook short activities on their phones often, such as using SNS, reading the news, and playing games; hence, it was thought that using mobile phones for short learning activities was not too large a jump from their normal practice (Principle 6). As suggested by Principle 1, the activities were designed to be carried out on a small screen with minimal input needed, which was thought to be appropriate for the mobile phones the learners possessed (Principle 8). Although an entire lesson was estimated to take around 20 minutes to complete, each activity was designed to be able to be completed in as short as 20-30 seconds (Principle 7). This timeframe meant that, depending on the number of incorrect answers that the learners produced while undertaking the activities, the activities were short enough that they could be completed with a minimum amount of effort in public places, such as while in transit (Principle 2).

As suggested in Principle 9, a period of thirty minutes was put aside at the beginning of the semester to ensure that students knew how to log in to both the PC and mobile interfaces, how to complete the activities, and how to change settings like the registered email address or the number of vocabulary items displayed in a single activity. Rather than relying on learners to access the site of their own volition, a push function was also included to prompt learners into undertaking the activities, or alternatively, to revise vocabulary items at a time of their choosing. Learners had the option to turn these notifications on or off if they so desired,



following Principle 3. Throughout the semester, learners were asked if they experienced problems with the mobile activities, and were shown how the mobile activities linked with the other learning activities carried out in class (Principle 10).

This brief example of an actual MALL environment illustrates the potential complexity in using mobile devices for language learning. However, it also shows that if certain precautions are taken, there is the potential to fit the tools to the learning environment in a way that gives learners freedom to make choices but at the same time encourages active participation.

Conclusion

Mobile-assisted language learning is quickly securing its place in language learning contexts, and the availability of the powerful tools that learners possess makes it an attractive supplement to other forms of teaching and learning a second language. It is crucial, however, for learners, teachers, policymakers, and employers to be keenly aware of the physical, pedagogical, and psycho-social issues involved in successful implementation of MALL. To this end, we have proposed principles that will be useful for those considering using mobile devices in their language learning context, both currently and in the foreseeable future. Importantly, these principles represent points of consideration, not full solutions, for an increasingly complex problem — how to incorporate mobile learning into language education. We have attempted to base these 10 principles on a range of sources, but we recognize they are not free of theoretical or selectional bias. We encourage others to challenge, reshape, refine, and build upon them.



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