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What to Make of MALL? Framing Mobile Devices in the Foreign Language Classroom

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Abstract

Technology and teaching have always gone hand in hand. From the development of tools to write and record information to the emergence of audio/visual aids to the current digital world, teachers have seen that the use of technology can facilitate the acquisition of knowledge on the part of the learners. So, it is understandable, that as new technology emerges, ideas on how it can help with education also emerge. When it comes to the learning of a foreign language, mobile devices have been viewed as wonderful tools to enhance learning. This paper examines what has been published on the topic and seeks to provoke thought on the pedagogical potential of using mobile devices for foreign language learning.

Introduction

A professor I had in graduate school once said that no one language is inherently more difficult to learn than any other. “After all, babies learn their native languages without a problem.” While that might be true for babies and first languages (L1), acquiring a second language (L2) later in life is not something most people accomplish with ease, and so they have teachers.

The teaching of a second language is often performed in a more formal setting, and that process has long been associated with the use of technology (Burston, 2013). From the development of the first writing instruments to the audio/visual boom of the 20th Century, newer technologies have often been touted as the next great thing in assisting with second language acquisition (Salaberry, 2001). During the 1990s, as the personal computer became more mainstream, Computer Assisted Language Learning (CALL) gained a wide audience. Though due to limitations of the technology and the software, many of the early implementations relied on typical “drill and kill” types of exercises (Dudeney & Hockly, 2012; Garrett, 1991). But advances in computer capabilities have been fast. In the 25 plus years since the emergence of CALL, the

limitations of early computing and computers have been mitigated due to the combination of Web 2.0 capabilities and the potential for seamless 24/7 connectivity through mobile technologies. To move on from CALL, the next step was to Mobile Assisted Language Learning (MALL).

First of all, it is important to note where MALL lies in the pantheon of technology related instruction. Ely (1990) differentiated between terms such as computer-assisted instruction (CAI) and computer-assisted learning (CAL). Some researchers refer to technology-enhanced learning (TEL) (Balacheff et al., 2009; Wong, Chai, Zhang, & King, 2015). And as the technology has gotten more portable, the term mobile learning (m-learning) has also become common (Mike Sharples, Taylor, & Vavoula, 2005). When the focus of learning becomes language we see the appearance of the second “L”, hence the terms CALL and TELL (technology-enhanced language learning). While CALL seems to be distinct from MALL, the same cannot be said for TELL (Chau & Lee, 2014), which encompasses any type of device that is employed for language learning.

In the current climate, where mobile phones, particularly smartphones, are ubiquitous, the meaning of the word “mobile” in MALL, seems fairly intuitive: pocket-sized mobile devices, like smartphones. However, this is not necessarily the case. As the devices and the level of web-connectivity and possible level of interactivity have changed, so has the definition of what “mobile” means when it comes to learning. In the first iteration of MALL, as MP3 players and items like PDAs became more commonplace, definitions tended to focus on the small size, and thus the mobility of the device. While that interpretation is still common today, Sharples, Arnedillo Sánchez, Milrad, & Vavoula (2009) point out that it is myopic to look solely at the devices because that viewpoint ignores the environment in which learning takes place, not to mention the people who are doing the learning. As learning is an ongoing process, they identify mobility as being related to the physical space of the learner, to the technology being used, and to the mobility of the learner in both conceptual and social space. Traxler (2009) says that mobile learning cannot be thought of as distinctly “mobile” or as distinctly “learning”, but as a “new mobile conception of society” (p.14). With no true consensus on the meaning of MALL, the use of the acronym can be somewhat confusing. Research papers that use “mobile” or “MALL” in the title or as a keyword tend to be using it to mean some point on that spectrum of device, location, or space, but not necessarily in the same way as another researcher might.

Wherever one’s definition fits in that range, MALL is an important field of study in second language acquisition, particularly where the language being learned is a foreign language (meaning the language outside of the classroom is not the target language, e.g., studying English in Japan as opposed to a person studying English in the United States). No matter whether one is a behaviorist, a cognitivist, or a constructivist, the ubiquity of “mobile” in today’s world

and the ability to seamlessly integrate content both in and out of the class offer the potential for instruction and learning that was unimaginable prior to the mid-1990s.

In my context, as a professor of EFL at a Japanese university, I see the potential of MALL to help my students learn English. Not a day goes by where at least one of my students has not forgotten to bring the textbook or even a student ID, which is required to record attendance. But without exception, all of my students own a smartphone, and that is never left at home. And very often, it is apparent that they are more focused on that, than on what is happening in class. Krashen (1982) wrote about the important role input plays in second language acquisition (SLA). My classes meet once a week for 90 minutes, and students are likely to have 10 other courses in addition to mine. With so little time for input, and so much time for unrelated input between these weekly classes, it can be near impossible to maintain any kind of language-learning momentum from class to class. However, with such smart devices in hand and the affordances of those devices can provide, the potential of MALL seems like a panacea to an entire host of limitations imposed by being in an EFL environment.

“Seems like” are the operative words here. Through this literature review, it is hoped to ascertain a clearer definition of MALL, examine how it is being employed, and discern whether or not MALL has shown to improve language gains among students studying a second language. The search for articles related to MALL was performed mainly through keyword and phrase searches through the University of Florida library databases and Google Scholar. Snowballing was also used to great effect as interesting references from already attained papers were sought out for further study.

Timeline of Research on MALL

Burston (2013) declares that the first published research in MALL was in 1994 by S. Callan, and it involved native speakers using PDAs to improve writing skills. Especially in Japan, early research with mobile devices often focused on things like emails and text messages with phones, and the use of electronic dictionaries or portable MP3 players (Rosell-Aguilar, 2007; Thorton & Houser, 2005; Yonally & Gilfert, 1995). In 2006, Kukulska-Hulme noted that ownership levels of digital devices such as media players, laptops, and smartphones had finally reached a level where MALL could evolve into an everyday experience for all. This level of market penetration also happened to coincide with the expansion of Web 2.0 technologies, opening up the opportunity of user interaction with content as well as a means for seamless collaboration with materials, teachers, and other students.

MALL as Interpreted for this Literature Review

As stated earlier, the physical mobility of the device is often considered a main component of MALL. Crompton (2013) said that because new technologies are emerging so rapidly, the listing of a specific device (or devices) is not possible, and proposed a definition of m-learning as “the utilization of electronic devices that are easily transported and used anytime and anywhere” (p.48). “Anytime/anywhere” is often used in extolling the virtues of MALL implementation. However, without some other limiting factors, that still leaves the concept of mobile rather unwieldy.

Mindt (1974) discussed the anytime/anywhere aspect of portable cassette tape recorders but did not find that single benefit to be enough to compensate for extra advantages of a traditional language lab using reel-to-reel tapes, where students can be monitored by an instructor, record their own voices, and then compare that recording to the model. While mainly an opinion piece on the (lack of) potential of an early iteration of MALL, it seems both relevant and irrelevant to current research. Relevant because Mindt (1974) addresses the issues about what features are gained and lost through the use of a particular mobile device and irrelevant because we are far beyond the use of portable cassette recorders or reel-to-reel language labs today. But if Mindt were writing a similar article today, comparing the modern smartphone with the modern language lab, I can’t help but think that he would support the use of mobile devices because they have the potential to provide many more benefits and opportunities for students than being required to study in a specific place at a specific time.

Therefore, in order to better put the “mobile” of MALL into a particular sphere of technology that limits the type of research relevant to modern implementation, the MALL devices that will be considered under the umbrella of this literature review have three basic characteristics: small enough to fit in a pocket, have a stable connection to the internet, and are likely to be owned by my students. This means I am mainly looking at smartphones and tablets, where in the population of my students, ownership is 100%. The reason student ownership is a component of how I look at MALL is because as a practicing professional, I am seeking to facilitate learning for the students I teach every day. In 2009, M. Sharples et al. noted that mobile learning had become a significant area of research over the span of just 10 years. In the years since then, that significance has only grown. For the most part, I tried to focus my article search on relatively “modern” contributions to the field.

Overview of Themes Seen in the Literature

Most of the literature seemed to fall within specific themes. A common theme was in answering the question of why we should be using mobile devices. As the incorporation of mobile devices into language learning continued to grow, there came the need to how best frame their implementation: what is a theory of learning that supports the use of MALL? Many papers in MALL are about attitudes and perceptions of teachers and/or students. Others, with and without an underlying theory, focused on implementation, and tended to focus on the development of specific skills, or provide a reason for implementation based on adhering to a certain theory on learning. Meta-analyses of MALL literature also seemed relatively common. These themes will be explored in more detail in the following section.

Presentation of Scholarly Works on MALL

Rationale for MALL

Salaberry (2001) stressed the need for a pedagogical objective when using technology in education. While saying that the field of mobile learning was still immature in terms of both the technology and the pedagogies, Traxler (2009) looked at how mobile learning had been implemented and listed some qualities regarding its pedagogical potential. Items on the list included collaborative learning, personalized learning, and the potential for mobile to be used in places where the technological infrastructure might not be enough to support traditional education. When it comes to language learning, this potential to expand learning beyond the walls of the classroom and to allow for more individualized control over their study are an often reported benefits to the use of mobile devices (Baser, Kopcha, & Ozden, 2016 ; Chinnery, 2006 ; Miangah & Nezarat, 2012). Overall, the general tone expressed in numerous articles indicate that there is a positive impact on learning by using mobile technology to study language (Bazo, Rodríguez, & Fumero, 2016; L. Hsu & Lee, 2011 ; Pagel & Lambacher, 2014 ; Viberg & Grönlund, 2013). If MALL offers such benefits, a theory or framework is necessary to explain why this is so, because use of a device is not the same thing as a method of instruction (Garrett, 1991).

Learning Theories and Frameworks

Any teaching activity should be grounded in some theory of learning, and MALL lends itself to a multitude of theories. Quizzes and skill-based tasks reflect behaviorism. Tasks that ask students to create aligns with constructivist ideas. Use of multimedia could reflect cognitivist

beliefs about learning. Doing some activity and then displaying an understanding of the new information is a type of experiential learning. Problem based-learning and task-based learning can all be accomplished through mobile devices (MacCallum & Parsons, 2016 ; Serin, 2012). But for a theory to be truly related to mobile learning, it needs to be based, at least in part, on the human/device interaction that is unique due to the nature of that interaction.

Activity Theory

Uden (2007) provides the background of Activity Theory, explaining an activity as a subject, an object, and mediation through the use of a tool. The objects and the tools might or might not be tangible items. Within Uden's framework, each component of an activity is conditional based on those that preceded it. In this framework, "mobile technology is not perceived as the object of learning, but as a tool to support students' learning activities" (p.88). Zurita & Nussbaum (2007) adapted the Activity Theory model to make a framework for collaborative learning. In this model, there are social roles and technological roles, and rules regarding each role. Interestingly, they found the mobile component offered various ways to support face-to-face environments. In another rendition of Activity Theory, Moura & Carvalho (2013) made a pedagogical framework which also added constructivist ideals and "the Attention, Relevance, Confidence, and Satisfaction (ARCS) Model" (pp.58-59). They found that mobile phone integration added value, but concluded with a warning about taking care not to place more focus on the technology than the learning objectives.

Liaw, Hatala, & Huang (2010) state that a mobile learning theory needs to recognize that a preponderance of learning will take place outside of the confines of the classroom and therefore, must take into account the use of "personal and knowledge sharing technology" (p.447). They see the activity of mobile learning as one in which learning is the result of culturally acquired knowledge which is then mediated and modified through technology. This is similar to Sharples, Taylor, & Vavoula (2006), who stated that a theory of mobile learning should not focus on the person or the device, but on the interaction between the two that can lead to learning. The components that fit into that interaction are: communication, context, control, subject, mediating artifacts, and the object. The end result will be knowledge learned, or a "changed object" (p.231). Crompton (2013) argues that any theory on mobile learning needs to focus on the intersection of "context, connectivity, time, and personalization" (p.56). Similar criteria are also reported by Liaw, Hatala, & Huang (2010). This interplay of items can be best studied through the lens of Activity Theory (Uden, 2007).

Affordances Theory

The idea of affordances was first proposed by Gibson (1979/1986), where he described them as a form of potential : what is being offered to an organism by its environment? Greeno (1994) defines an affordance as “whatever it is about the environment that contributes to the kind of interaction that occurs” (p.338). Greeno (1994) also connects the idea of “constraints” to the idea of affordances. Where an affordance is the potential for an activity, constraints are the pre-conditions that must be met for the activity to take place. As an example, a smartphone might offer the affordance of anytime/anywhere study, but that potentiality is constrained by the remaining power of the battery. Gibson’s theory was originally about the natural environment, but the idea of affordances was gradually expanded to include other fields of research, including language acquisition (Aronin & Singleton, 2012).

When it comes to MALL, the affordances of mobile devices fall into two main categories : the potentialities made available by the physical aspects of the device and the educational potentialities made available by the capabilities of the device.

Physical Affordances

The physical affordances refer to the device itself. The most obvious physical affordance is the ease of portability due to a mobile device’s size (Ilic, 2015 ; Lan, Sung, & Chang, 2007 ; Rosell-Aguilar, 2007). While a touchscreen allows for both passive and active engagement (Alhinty, 2015 ; Lai, Yang, Chen, Ho, & Chan, 2007 ; Pellerin, 2014), the size of the screen, problems with quality, and a limited power supply can also serve as a constraints (Chinnery, 2006 ; Lan et al., 2007 ; Rosell-Aguilar, 2007). The relationship between a device’s storage capacity and an intended file size can serve as an affordance or a constraint (Al-Said, 2015).

Educational Affordances

According to Lai et al. (2007), educational affordances are the “characteristics of an artifact that determine if and how a particular learning behavior could possibly take place within a given context” (p.328). They then go on to show how apps made available for smartphones and tablets allow for a host of reading, listening, speaking and writing activities. The use of mobile devices allows for learner-centered activities and student autonomy (Hsu, Hwang, & Chang, 2013 ; Xu, 2016). An added affordance of mobile devices is that their use is not limited to a specific theory of learning. MacCallum & Parsons (2016) and Serin (2012) illustrate how mobile learning activities can fall under coverage of numerous learning theories.

Perhaps the most adaptable affordance is that which allows mobile devices to connect to the internet, which opens up even more affordances. With a seamless connection to the internet,

social networking apps and the affordances of Web 2.0 can allow for learners to engage in authentic social interaction and collaboration (Ilic, 2015; Lan et al., 2007; Mcloughlin & Lee, 2007 ; Peters, 2009). Between apps and the ability to connect to the internet, smartphones offer affordances that make them the pedagogical equivalent of a desktop computer (Burston, 2014b). However, in a study of student knowledge of and ability to use the affordances of smartphones and Web 2.0, Cochrane & Bateman (2010) found that successful implementation required that time was spent in training students on how to use them.

Though not specifically for mobile devices, Song & Kong (2017) surveyed 17 higher ed teachers in Korea about the a bring your own device (BYOD) program. They identified seven affordances related to resources (access, collection, submission, and sharing), communication, knowledge construction, and representation. They also identified constraints divided into three categories: technical, social and personal. Technical constraints were related to app functionality, screen size, infrastructure to support the devices, and processing power. Social constraints were had to do with equity (not all students had the same devices), teaching support, and a reduction in face-to-face communication. Personal constraints were about technical competence, attitudes, time consumption, finding matching apps for different devices, and pedagogy (using the device was not always relevant to the teaching activity). Aside from the pedagogical constraint they identified, the same constraints with mobile devices were identified by Burston (2014), who also decried the lack of standardization among devices as a barrier to a smooth integration of (student-owned) mobile devices into a program of study.

TPACK

The Technological Pedagogical Content Knowledge (TPACK) framework as developed by Mishra & Koehler (2006) says that the effective use of technology in education requires knowledge of content, knowledge of pedagogy, and knowledge of technology. Where any two of those domain areas of knowledge intersect on a Venn diagram, they get combined into a more specific type of knowledge, e.g., “Technological Pedagogical Knowledge”, “Pedagogical Content Knowledge” and “Technological Content Knowledge”. And where all three domains meet, there is “Technological Pedagogical Content Knowledge” (p.1025). To define the TPACK in more simple terms: educators need to know the subject matter, need to know how to teach, and need to know how to use technology, and from there, they need to be able to cohesively combine those areas of expertise to design effective lessons that make use of technology.

Despite the lack of clarity regarding how understanding the components of the TPACK translate into better integration/implementation of technology (Brantley-Dias & Ertmer, 2013), it

is nonetheless commonly seen in MALL research. Baser et al. (2016) developed an assessment based on the components of the TPACK, but made specifically for EFL teachers. While most literature on the TPACK is about theory, Wong et al. (2015) used the framework as a basis to design and implement a Chinese language learning program in Singapore. In that case, researchers met with teachers to assess their content and pedagogical knowledge, then used their own technological knowledge to work with software developers to create a “seamless” learning environment that incorporated cloud-based materials and the potential for mobile access.

Attitudes and Perceptions Prior to Implementation

Attitudes and perceptions are a common topic of MALL research. Many are conducted in isolation, without being part of any specific treatment of mobile implementation on the part of the researcher.

Looking at students’ attitudes, Al-fahad (2009) conducted a survey with 186 female university students in Saudi Arabia. In this study, 53% of the students agreed with the idea that mobile learning could be effective and 63% thought the mobile devices would help improve communication between teacher and students. Possible constraints were a lack of phones and the expense of using them. A few years later, Alhassan (2016) surveyed 638 male Saudi college students about the potentials of EFL study using mobile devices. Results showed a high level of interest in using mobile devices, but also little knowledge and experience with the affordances of Web 2.0. As for constraints, students were worried that they might suffer from having to comb through too much information, that the phones could be a possible distraction, and they were worried about unwanted contact from their teachers on their personal devices: different worries than the Al-fahad (2009) study.

Chen (2016) surveyed university teachers and students in Taiwan and found that both students and teachers had a high acceptance rate on the idea of using mobile technology, but that it was much higher for students. Chen also found that the younger the teacher, the higher the level of acceptance. In a very small scale case study of ESL teachers in the UK, Van Praag & Sanchez (2015) found that, for the most part, his participants saw the use of mobile phones in the classroom as taking away from the power they held in their classes. The most acceptable use of mobile phones was the camera function, where students were allowed to take pictures of the blackboard. In Turkey, Serin (2012) surveyed 1,171 pre-service teachers from a variety of disciplines and found that for most, the perception about mobile learning was low, and that those perceptions had little variation among specialties. In contrast, in a large scale study the Turkish

Republic Northern Cypress, Ozdamli & Uzunboyly (2015) found that teachers and students had positive impressions of the potential for mobile learning but that their competencies with using the devices was not so well developed. And like others (Kukulska-Hulme, Norris, & Donohue, 2015; Passey & Zozimo, 2016), they concluded with the recommendation that teachers need to be taught about the potential of teaching with mobile devices.

MALL Implementation

When looking at publications that report on MALL implementation, the best way to cohesively categorize and organize studies can become an issue. One way would be to categorize by intended learning outcome, e.g., vocabulary development or reading skills. Another would be based on the type of lesson, e.g., collaborative or task-based. But as I examined the articles I had read for this literature review, I saw three basic themes emerge: the “how to” article, the “forced” or “basic use” article, and those that focused on the affordances of mobile technology.

How to

The “how to” articles tend to focus on a process of incorporating MALL, not on a study that examines what happened when a variation of MALL was implemented.

An early article is by Rosell-Aguilar (2007). Capitalizing on the affordances of the iPod and distribution through iTunes, Rosell-Aguilar (2007) writes on the teaching of language by making use of audio podcasts. Due to the overwhelming number of available podcasts, he discusses the difficulties that can be encountered in selecting appropriate material and suggests specific podcasts. Rosell-Aguilar (2007) also talks of the potential for students to make their own podcasts, and includes advice on design and content. One of the benefits mentioned by Rosell-Aguilar (2007) is that the materials can be designed for independent learners. With minimal description, Xu (2016) also cites the potential of mobile devices to help learners take more control of their own studies. Results from this study, involving 120 college EFL students showed that the experimental group had better scores and that mobile learning had increased their motivation and helped the students to become more autonomous. Though the treatment is not described, there is a section that lists effective strategies for increasing learner autonomy.

Referencing the affordances offered by multi-touch screen devices, Alhinty (2015) offers a “how to” article that is strongly referenced and based on theoretical foundations supporting the use various types of apps to teach young EFL learners. Alhinty (2015) categorizes apps as communicative, content access, productivity, interactive, storing. Their use is justified through theory, and apps are suggested for each category. The intuitive interface of these mobile

devices “may provide young learners with ample opportunities to learn the target language in an enjoyable, seamless way, either autonomously or with guidance, and equip them with the technological skills necessary for learning in the 21st century” (p. 58).

At the institution level, McCarty, Sato, & Obari (2017) devote a chapter in their book *Implementing Mobile Language Learning Technologies in Japan* to a case study of one university’s implementation of a mobile EFL curriculum. The process occurred over three iterations, beginning in 2000. From April 2004, all freshmen at Osaka Jogakuin University (OJU) received an iPod and podcasting was a big part of the EFL curriculum. Starting in 2012, the iPods were changed to iPads. This chapter covers the training of faculty and staff, issues and challenges with assorted stakeholders, an assessment of effectiveness, and ends with recommendations for other institutions that are thinking of implementing a MALL protocol. This chapter provides a good overview of how such implementation can be accomplished.

Forced or Basic Use

While MALL has great potential, the use of mobile devices in a study can often seem artificial or unnecessary to the learning objectives.

Vocabulary acquisition is often falls under this category. Nisbet & Austin (2013) cite a 2009 book about the study of vocabulary and list four components that are said to make for effective vocabulary acquisition : “(a) teaching individual words, (b) teaching word-learning strategies, (c) providing rich and varied language experiences, and (d) fostering word consciousness” (p. 3). After making an unsubstantiated claim that students can become engaged by studying through mobile phone apps, they list 15 apps that they think will be of help to students. The apps were chosen based on price, though no prices were mentioned, quality, and the minimal learning curve required to use them. Q. Wu (2015) writes about the design and implementation of a vocabulary app for Chinese EFL students. The app was very limited in functionality because its design was intended to not bother students with “superfluous content such as synonyms, antonyms and usage examples” (p.176), thus eliminating three of the four components of effective vocabulary study listed above. This app was specifically designed to help Chinese students with a particular language test, and the experimental group showed a modest gain of 6.96% over the control group. A more rigorous study was conducted by Azabdaftari & Mozaheb (2012), and that an experimental group of 40 showed significant improvement over the control when studying vocabulary on mobile phones.

One of the affordances of devices connected to the internet is the ability to collaborate. In another early study, Lan et al.(2007) experimented with mobile devices, Taiwanese elementary

EFL students, and reading collaboration. In the study, experience in collaboration between the control group and the experimental group was different, and for the collaboration part of the treatment involving mobile technology, the students all appeared to be in the same classroom using school laptops, making the online collaboration unnecessary and the mobile part irrelevant. In the end, their “impression” (p. 142) was that confidence and motivation were increased and anxiety was reduced. Wu & Marek (2016) used the social networking app LINE for a cross-cultural collaboration project involving students from Japan and Taiwan. The goal was to write collaborative essays of at least 700 words using this smartphone app. But the students were instructed that if it was too much trouble to use LINE, they could just email each other, implying the use of a PC was acceptable. At the end of the study, the researchers did not examine if writing ability had improved, but sought to “uncover the feelings of the students” (p. 11).

Personalized learning and individualized control of that learning are some of the advantages of MALL. But that only applies if the students are in control of the devices. In 2012, Kondo et al. did a mixed-methods study using a Nintendo DS device loaded with a TOEIC skills app. In terms of greater gains on a post-test, there were mixed results, with no significant difference on the listening section between the experimental and control groups. After the first term, a follow-up study was conducted to see if students would continue to study independently. Of the original 42 students using the device, only 15 students willingly chose to participate, and of those, six never used the device during the following semester. The other nine showed dramatic decreases in time spent using the Nintendo DS. Ishikawa et al. (2014) developed an ESP reading app for Android intended to help students learn low-frequency words and technical collocations. Students were provided with the Android devices. The app was tested on 27 students over a 16-week period, and at the end of the treatment, students seemed to read faster and enjoy reading more. However, the survey showed that there was very little reading done outside of class. An interesting result was that the students said they would have preferred to get a hard copy of target vocabulary.

Hsu & Lee (2011) used Android phones to teach topics related to tourism English to university students in Taiwan. The control group was taught in class and the experimental group was taught through their phones. The only difference was the media for delivery of the class content (face-to-face vs. via mobile phones). Their results showed that the experimental group had positive impressions of learning travel English through their phones, and differences between pre/post tests showed that they performed slightly better in terms of vocabulary, grammar, and listening comprehension. But with this kind of experimental design, it is hard to see what affordance of the mobile phones was being taken advantage of. C. K. Hsu et al.

(2013) also used mobile devices in class. In this study involving 108 Taiwanese high school students, there was a control group and two treatment groups. The independent variables were recommended reading and shared (or not) annotations. Students were tested on the Technology Acceptance Model (TAM), Cognitive Load and were given pre/post-tests to measure language acquisition. The recommended reading articles had more of an impact on learning and equated with a lower cognitive load. The collaborative use of annotations did not have an impact. As there was no pre-test on the TAM, the impact of mobile usage is hard to calculate. In this study, as everything was done in class, it is also hard to see what affordances specific to mobile technology were critical to the study.

Affordances

A greater body of literature deals with the capacity of smartphone or tablet affordances that can enhance students' learning. How these articles differ from those above that the affordances examined involved a more natural use of a device.

Ahn & Lee (2016) developed an Android speaking app for middle school students in Korea. Voice recognition allowed the students to have "conversations" with digital characters. Furthermore, there were record functions and shadowing tasks. Results showed that the students enjoyed the app, and felt that it helped with their English, but tests were not conducted to assess whether or not the app actually helped them improve their English. In an implementation that did involve a language assessment, Gitsaki & Robby (2014) studied the use of iPads with 370 UAE high school graduates who had not yet passed university entrance exams. While it was unclear if the students were provided with the iPads or not, this study differs from the Kondo et al. (2012) study, in that the device is much more common than a Nintendo DS and the student were free to use the devices to create their own personalized learning environments, seamlessly integrated with their everyday activities, both in and out of class. While there was no control group, the majority of students self-reported high levels of motivation to study English, and the researchers found that increased usage of the iPad correlated with improved scores on the IELTS exam.

In research based on the affordance of collaboration, Ilic (2015) performed a small-scale study using data from 22 Japanese university students studying EFL. The study was grounded in the theory of collaborative learning promoting interaction and can be incorporated with lifelong learning. The mobile aspect allowed students to participate across time and space separated from the classroom. Results showed that the affordance of mobility coupled with the ability to connect with their classmates encouraged students to contribute to the overall discussion in times

and places where they normally wouldn't. Ilic (2015) makes the point that the collaboration through the smartphone "changed the nature of the homework from a very public activity to a more private one by bringing the homework into areas of their lives not possible with traditional technology" (p.31). However, as is typical with many studies related to MALL, there was no measurement of changes in language ability.

In another study out of Japan, Freiermuth (2015) sought to increase student engagement by using an affordance I have not seen described in MALL literature before : GPS. Rather like a treasure hunt, class assignments were hidden in "geocaches", and students were provided with the GPS location. The 10 university students that participated in this study had to first find the assignment before they could complete it. Once found, there was a meta-cognitive task (describe your experience) and a language task. The 10 students enjoyed the process and felt a higher level of intrinsic motivation. However, once again, there was no assessment to see if this type of activity had any effect on language ability.

Meta-analyses

For such a young field, meta-analyses of the literature seem to seem to be common articles in MALL.

One of the most prolific writers of MALL meta-analyses is Jack Burston (2013, 2014a, 2014b, 2015), who has written extensively on the subject. In 2013, he found that there were 347 publications between 1994 and 2012 that were about some form of implementation practice. In 2015, he made a point of illustrating how most of those articles were not published in the types CALL journals which would most likely catch the attention of scholars, educators, or researchers of similar interests, but were published in journals with themes ranging from distance education to lexicography.

In Burston's analysis (2015) of these 347 publications, he found flaws in the research design that eliminated roughly 90% from having any significant findings. Research flaws included:

- Durations that were too short, some as short as 5 or 10 minutes
- Number of subjects were too small, more than half with fewer than 25
- Lack of clarity in duration and/or number of subjects
- Lack of any quantitative data

In the end, learning outcomes were found in only 35 research projects that lasted longer than a month and included more than 10 test subjects. Of those, another 16 studies had to be cut for such reasons as :

- no data on usage
- the presence of uncontrolled or confounded variables
- weakness in descriptions of control groups
- lack of adequate statistical analysis

Of the remaining 19 studies, 11 were about vocabulary acquisition (of which 9 showed positive results), 4 were about reading competency (all showed positive results), 3 were about speaking/listening skills (all of which showed positive results), and 1 which was about writing skills (which showed a positive result).

Other authors of comprehensive meta-analyses are Viberg & Grönlund (2012, 2013). Though smaller in scope than Burston, Viberg & Grönlund's 2012 paper gave an overview of research published between 2007 and 2012. They looked at 54 empirical studies, and found that 44% of those were only descriptive, not reflecting any theory on MALL. Experiments only made up 47% of the research. They displayed the 54 articles in a table and based on the concepts of the study, identified the following thematic categories:

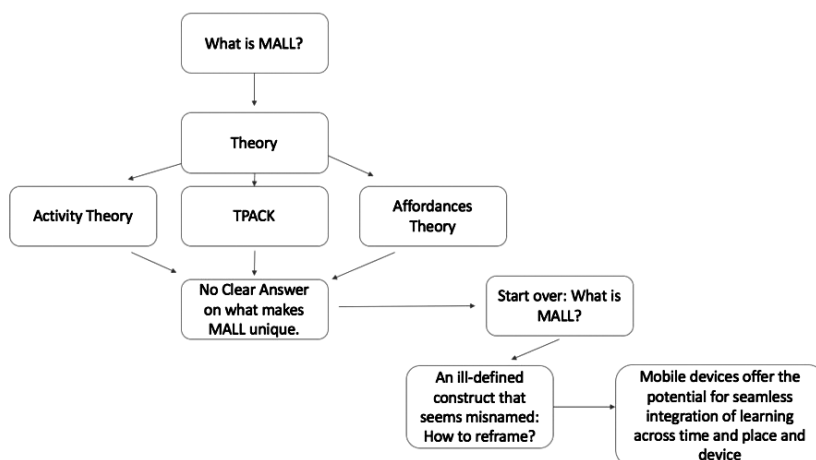
- Technological Concepts of Learning
- Technology-Centered Concepts
- Learning Environment: Theoretical Development
- Learning Environment: Practical Aspects

In this paper, they conclude that there is "a lack of specific reference to mobile learning conceptual frameworks and theoretical models, which makes it difficult to clearly distinguish the theory of mobile learning from other learning theories and approaches" (p.6).

In 2013, Viberg & Grönlund expand on this research to include MALL research conducted from 2005–2012. Specifically, they wanted to look at the theories or research methods being used, the aspects of MALL being researched and any results that have been reported. This literature review covers the same ground as the 2012 study, but looks at an additional 32 publications. When it came to the assessment of theories being used in MALL research, they came to the conclusion that MALL was still a relatively immature field because there are no theories that are specific to MALL.

Conclusion

Conceptual Framework Guiding this Review :



In surveying the literature about MALL, one thing becomes apparent : research on MALL is all over the map. There is a general consensus that mobile technology is the next great thing in foreign language education, but the construct of MALL is different depending on the researcher. The problems in researching what has been done in the field begin with the name itself: MALL. Not everyone who is conducting research on the use of mobile devices for second language acquisition uses that term. Commonly used alternatives are m-learning or mobile learning, but there are some uncommon terms as well. In a paper that continuously uses more acronyms than should appear in any single paragraph, Jarvis & Achilleos (2013) argue that when using OMDs (other mobile devices aside from notebooks and laptops) with NNSoE (non-native speakers of English) to study language, that the true heir of CALL should be MALU (mobile assisted language use). So if we can't decide on what to call it, then finding relevant research can be a problem. This problem is further exacerbated by the observation of Burston (2013, 2015) that research is published in a wide variety of education-related journals meaning relevant research might not be found where expected.

When I started this journey, I thought the TPACK was close to being on target in describing EFL education with MALL. But it seemed to be about the teaching, not the learning, and in the end, I realize that as Brantley-Dias & Ertmer (2013) say, the TPACK is too vague to offer any guidelines for implementation. A proper analogy might be that the TPACK is to teaching what the VPACK (vision, proprioception, automotive content knowledge) is to driving. Just being able to see, to know where body parts are and how to move them, and to have an understanding about controlling a car does not really inform on how to teach someone to drive.

While Affordances Theory and Activity Theory seem applicable to mobile learning, they are not specific to it. A piece of paper offers many of the affordances of a smartphone: the ability to be used anytime/anywhere, to store or provide information, to collaborate with others, to transmit information over distances. And Activity Theory can be evidenced by working through a math problem with a pencil and that same piece of paper.

So what is unique to MALL? If a mobile device is used for the sole purpose of being a source of language input/output, then it is just a form of media, and harkens back to the “Learning from Media” debate argued by Clark (1983) and Kozma (1991). If the mobile device is being used as a reflection of a learning theory, then how is that theory specific to second language acquisition? Theories such as social constructivism, mediated learning, situated learning, collaborative learning, task-based learning are all about one thing: learning. Since we don’t see such fields as mobile assisted science learning or mobile assisted history learning, even though instruction in those fields has been enhanced with mobile devices, why do we have this sub-division of language when it comes to mobile assisted learning?

When compared to the language labs described by Mindt (1974) it is easy to see how the field of CALL emerged. Computers changed the way languages could be studied and learned. Mobile devices have just added more portability to what is possible with CALL. But when it comes to rationalizing MALL, Viberg & Grönlund, (2013) seem right on target when they say, “regarding theories, we found the field to generally be in search mode” (p.83). In searching for that theory, should the focus be on the learning or on the teaching? Despite different perspectives on what happens in the mind of the learner, there seems to be general agreement the types of tasks that help with learning. Even Krashen’s (1982) idea of comprehensible input could be applied to any form of learning. The difference between a description of how the heart works would be quite different between an elementary school textbook and one for medical students. As this field is of primary interest to teachers, perhaps MALT (mobile assisted language teaching) would be more appropriate.

Gaps in the Research

With regards to MALL, the gaps in the research mind-boggling large in that there has been very little empirical research that show the benefits the use of mobile devices can bring to second language acquisition. Another not so obvious gap is in the choice of subjects. Throughout this literature review, the age range of subjects involved with these studies went from children to adults. For the most part, the one thing that all the subjects had in common was their foreign

language ability: low. As far as I saw, there are no studies looking at how advanced learners are using mobile technology to maintain or improve their language skills.

Directions for Future Research

While “ubiquitous” has to be one of the most ubiquitous terms seen in MALL-related literature, another term that became apparent through this research was “seamless”. Seamless integration between school, class, home, formal learning and informal learning seems to be the one affordance that makes mobile devices unique. Hwang, Lai, & Wang (2015) write of “seamless flipped learning” in which mobile devices are a part of an overall circle of connectivity as the learners move throughout their day. Through cloud-based social networks, storage networks, and productivity sites, mobile devices offer students the ability to seamlessly move between places and time while simultaneously maintaining a connection to the work, study materials, or research projects they began on a different device in a different location.

Working in a developed country where there is no shortage of access to technology, I feel educating students on the potential of seamless learning could have a positive impact on their language acquisition, not to mention their general knowledge acquisition. This means reframing ideas about teaching and about learning in order to include mobile technologies as part of the learning process, not isolate them as a separate field of study. “If we are going to prepare students for the 21st century, we need teachers to adopt new pedagogies (e. g., problem-based, case-based, inquiry-based, etc.) as well new curricula in which technology plays an integral but supporting role” (Brantley-dias & Ertmer, 2013, p.117).

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