

Examining the effects of independent MALL on vocabulary recall and listening comprehension: An exploratory case study of preschool children

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Abstract

In recent years scholars have explored the use of mobile devices as potential sources for language learning and teaching. Mobile phones and tablets, especially, have been researched with a focus on effectively building vocabulary primarily among university-level students. Comparable research in other age groups has not been as widespread. This study examines the nature of preschool-aged children's use of iPads for independent language learning. In addition, the study identifies the characteristics of the participants' (n = 7) preferred apps and aims to determine if the participants were able to make gains in vocabulary recall and listening comprehension after a six-month period of independent language learning. The results of this study indicate that the children and their parents established rituals and clear guidelines for playing on the iPad as a means to provide language-learning opportunities. Additionally, they were able to demonstrate moderate gains in vocabulary recall and listening comprehension.

KEYWORDS: LANGUAGE LEARNING APPS; LISTENING COMPREHENSION; MOBILE-ASSISTED LANGUAGE LEARNING; VOCABULARY RECALL

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Introduction

In the United States, preschool to 5th grade (P-5) public schools continue to experience a lack of appropriate resources and formal language programs due to a shortage of funding and certified instructors. As of 2008, only 25% of elementary and middle schools offered foreign language instruction; programs at the preschool level are not regularly documented because they are so scarce (Rhodes & Pufahl, 2010). The most commonly offered program at the elementary level is the exploratory model, which provides introductory exposure to the language (Rhodes & Pufahl, 2010). While there are few P-5 foreign language programs, there is a multitude of foreign language apps available to children in this age group. Tablet sales delivered into K-12 schools in the United States exceeded 3.5 million units in 2012, a growth of 340% from 2011, and these sales were expected to double again in 2013 (Drinkwater, 2013).

As mobile technologies evolve and become even more accessible, it is essential that foreign language educators and researchers continue to innovate and document the effectiveness of such tablet-based projects on language learning. In recent years there has been tremendous growth in research focusing on the use of mobile-assisted language learning (MALL), especially MALL's potential impact on vocabulary building (Chen & Chung, 2008; Chen & Li, 2010; Lu, 2008; Stockwell, 2010; Zhang, Song, & Burston, 2011). In addition, most of this research has been conducted at the university level. However, few studies have investigated the nature of learning vocabulary via portable devices with preschool-aged children. Among the studies conducted with this age group, Mayoral, Flores, Gonzalez, and Sebire (2012) found that young children responded naturally to the chosen apps as teaching aids used to present vocabulary items. Additionally, when introducing young Turkish learners to English as a Foreign Language, Yildiz (2012) determined that iPad app use yielded positive effects on receptive and expressive vocabulary acquisition, phonological awareness, and listening comprehension skills. The present study aims to continue with this line of research by investigating vocabulary acquisition and listening comprehension with preschool-aged children.

Literature review

MALL expands on the traditional field of computer-assisted language learning by focusing on the use of handheld devices (Chinnery, 2006) such as mobile phones, tablets, and iPods. Much has been reported on the availability of mobile devices (Thornton & Houser, 2005) and the increased portability and flexibility (time and location) provided by MALL (Chinnery, 2006; Godwin-Jones, 2005), which may contribute to the accessibility of language learning in informal settings. For example, White and Gillard (2011) suggest that, due

to budget constraints and limited language learning resources, schools should consider turning to games, simulations, and applications for mobile devices as potential resources to expand language learning and teaching.

MALL research has demonstrated the potential for mobile devices to supplement face-to-face (F2F) instruction (Browne & Culligan, 2008; Saran & Seferoglu, 2010). These studies show that using mobile devices is effective for enhancing vocabulary knowledge and addressing the needs of unique learning contexts. Such research confirms that MALL “creates the potential for significant change in teaching and learning practices” (Kukulska-Hulme, 2009, p. 1). Thus, building on the accessibility, portability, and flexibility provided by MALL, language learning may be extended outside of the formal learning environment. Indeed, there have been more than 150 reports of MALL studies related to vocabulary acquisition (Burston, 2013). One such study demonstrates that there are no major differences in students’ performance via mobile devices when compared with desktop computers (Stockwell, 2010). Additionally, research indicates that such devices can have a positive impact on second language learners’ vocabulary recall. For example, Saran and Seferoglu (2010) determined that the use of multimedia messages via mobile phones was effective in enhancing vocabulary outside of the classroom. Similarly, Browne and Culligan (2008) found that the use of vocabulary flash cards via mobile phones was beneficial for learners because of the flexibility provided. Yang and Xie (2013) reported that the use of iPads for learning Chinese idioms was both effective and enjoyable for university students. Collectively, this research indicates that age-appropriate activities via mobile devices yield positive learning outcomes for university students.

One might assume that such benefits would carry over to other levels of education; however, relatively few studies have investigated this type of learning outside the context of higher education. Drawing from Burston’s (2013) comprehensive bibliography of MALL implementation studies, roughly 90 of 575 published MALL studies (approximately 15%) over the past 20 years were conducted outside of higher education. “Primary school and secondary pupils together account for less than a quarter of targeted language learners” (Burston, 2014, p. 110). Furthermore, approximately 45 of these reports targeted children in elementary schools (7.5%), and only one identified in the bibliography documented research conducted with preschool children (Yildiz, 2012).

Most studies have investigated college-aged students because this age group is more likely to own a mobile device (Rainie & Smith, 2013) and researchers have easier access to university students with fewer ethical concerns. However, two notable studies have documented the use of iPads for language learning with preschool-aged children (Mayoral et al., 2012; Yildiz, 2012). Mayoral et al. (2012) documented an early intervention project in

Mexico, in which children 45 days to 4 years old were systematically exposed to iPads and language learning apps for English as a second language. The researchers cite the importance of engaging this age group to take full advantage of the brain's plasticity at an early age. They also indicate that the children were able to respond naturally to the chosen apps as teaching aids to present vocabulary, and they experienced significant gains in vocabulary recall. The second iPad-based study (Yildiz, 2012), implemented with preschool children, utilized the game-like app *LinguPenguin* to introduce English as a Foreign Language to Turkish children, because it was felt using the iPad would further stimulate language learning. After examining the results of a Cambridge Listening Test and Peabody Picture and Expressive Vocabulary Tests, the researcher found that by engaging in independent language learning via iPad apps the children experienced positive effects on receptive and expressive vocabulary acquisition, phonological awareness, and listening comprehension skills.

In an attempt to document the nature of using iPads for independent language learning among younger learners, this study examines the use of free Spanish apps by preschool-aged children, four and five years old, and the subsequent impact on their vocabulary recall and listening comprehension. This was undertaken in order to help determine if learning via mobile devices might be a possible solution for the relative lack of language learning opportunities for preschool-aged children. From a broader perspective this study investigates the validity of the commonly held perception that the use of mobile devices expands affordances for language pedagogy and learning (Kukulska-Hulme, 2009). Thus the overarching research question is this: Can iPads, tablets, and other portable devices be used to provide meaningful linguistic exposure to preschool-aged children when formal F2F programs are not available? More specifically, this research addresses the following questions:

1. Where, when, and how do preschool-aged children participate in independent iPad-based language learning?
2. Among the free Spanish apps available for the iPad, which do preschool-aged children prefer for independent language learning? What are the common characteristics of these apps?
3. To what extent are preschool-aged children capable of demonstrating increases in animal vocabulary recall as a result of participating in independent iPad-based language learning?
4. To what extent are preschool-aged children capable of demonstrating increases in listening comprehension for animal vocabulary as a result of participating in independent iPad-based language learning?

The study

An exploratory case study method was employed to examine independent iPad-based language learning as a contemporary phenomenon in a real-life context (Yin, 2009). As Hays (2004) notes, the case study approach enables researchers to address research questions through collecting and interpreting descriptive data in a limited timeframe. The following sections outline the procedures implemented for participant selection, data collection, and data analysis.

Participants and research context

The participants of this study were seven preschool-aged children (four to five years of age) enrolled at a private preschool in the United States. Four of the children were girls and three were boys. A total of 22 children (enrolled in the same preschool class) were invited to participate in the study. Ultimately, the participants of this research were purposively selected (Maxwell, 2005) based on the parents' willingness to participate. This form of participant selection maximized participant availability and accessibility throughout the research process (Yin, 2009). The parents of each child owned an iPad prior to the study or agreed to purchase an iPad for the purpose of participating in the study. It is important to note that the sample was not homogeneous; a background survey revealed that two of the participants had minimal prior exposure to Spanish before participating in the study. The remaining five participants had no prior exposure. The background survey also indicated that the families were middle-class and most of the parents were college-educated. See Table 1 for an overview of the participants' characteristics.






Table 1: Overview of Participant Characteristics

Participant	Age	Sex	Previous Spanish exposure	Experience with iPad
1	5	F	8 weeks of one hour weekly preschool classes	Basic children's apps
2	4	M	4 weeks of 30 minute weekly preschool classes	Basic children's apps
3	5	F	None	None
4	4	F	None	Basic children's apps
5	4	F	None	None
6	4	M	None	None
7	4	M	None	Basic children's apps

Five free Spanish apps for children were downloaded to the participants' iPads. Table 2 identifies these apps and their defining characteristics. Each app contained at least one component that focused on animal vocabulary. Animal vocabulary was selected because it represents a vocabulary set most

children are familiar with and enjoy, especially for the preschool age group. Once downloaded none of the apps required an Internet connection. The participants were allowed to freely select and explore the applications; there were no explicit guidelines for their use. It is also important to note that for the purpose of this research all other children's apps were removed from the device to ensure the children would play with the language learning apps. Finally, parents were asked to encourage their children to utilize the apps for at least 15 minutes each day over a six-month period, but not to participate in the learning process with their child.

Table 2: Apps and their Defining Characteristics

App	App name	Defining characteristics
	Spanish Smash	<ul style="list-style-type: none"> • Vocabulary matching (audio to pictures) • User touches appropriate picture when hearing audio of vocabulary item • Multiple levels with increasing difficulty
	LinguPinguin	<ul style="list-style-type: none"> • Bilingual vocabulary identification • User touches picture to hear audio identifying the vocabulary items in Spanish and English
	Busuu Kids	<ul style="list-style-type: none"> • Vocabulary identification • User touches picture to hear audio and read text identifying vocabulary items in Spanish
	Bilingual Child Bubbles	<ul style="list-style-type: none"> • Vocabulary matching (audio to text and pictures) • User touches appropriate picture when hearing audio of vocabulary item
	Bilingual Child	<ul style="list-style-type: none"> • Bilingual vocabulary matching (audio to text and pictures) • User touches appropriate picture when hearing audio of vocabulary item • Multiple levels with increasing difficulty

Data collection and analysis

This case study employed multiple methods of data collection including a background survey (Appendix A), observations, interviews (Appendix B), and participant activity logs (Appendix C), as well as pretests and posttests of the participants' vocabulary recall and listening comprehension. First, responses to the background survey, completed by the children's parents, provided useful data about the participants with regards to prior experiences with Spanish and previous use of an iPad. Second, a series of four observations and

four semi-structured interviews were conducted with each family, the child and the parents (in their homes), to verify and explain the findings established from the observations and elicit responses related to the participants' use of the apps. Third, a review of the participant activity logs, completed by the parents, was conducted to analyze patterns in the children's iPad usage. Fourth, pretest and posttest vocabulary identification activities were conducted with the participants to evaluate the effects of independent iPad-based language learning on their vocabulary recall and listening comprehension.

To measure the degree of change related to vocabulary recall exhibited by the children, pretests and posttests were administered using the 23 animal vocabulary words and images presented in the apps. See Appendix D for a list of these vocabulary items. For the purpose of these vocabulary recall activities the children were shown pictures of the animals taken from the apps and asked to identify them orally in Spanish. The pretests were conducted on day 1 of the study with each child to establish a baseline data point. To evaluate the degree of change related to the children's listening comprehension, pretests and posttests were implemented using the 23 animal vocabulary words and audio recordings taken directly from the apps. The children were asked to identify the items in English. Paired sample *t*-tests were implemented to determine statistical significance in the changes.

Using the constant comparison method (Glaser & Strauss, 2009), data analysis began with the systematic coding of the interview transcriptions, the researcher's field notes, and the participant activity logs. Emerging themes were identified using three recursive processes: category construction, data verification, and testing and confirming (Merriam, 2009). The quantitative analysis for the data collected via the pretests and posttests of vocabulary recall and listening comprehension involved descriptive statistics, including measures of central tendency, and paired sample *t*-tests. The primary purpose of this stage of analysis was to determine whether the participants were able to make gains in vocabulary acquisition after the period of independent iPad-based language learning.

Findings for research questions 1 and 2

Where, when, and how do preschool-aged children participate in independent iPad-based language learning?

Among the free Spanish apps available for the iPad, which do preschool-aged children prefer for independent language learning? What are the common characteristics of these apps?

Data from the observations, interviews, and activity logs indicate that the most frequented locations for utilizing the iPads were the home (e.g., on the couch, floor, bed, and dinner table) and the car. The children and their parents

experienced a great amount of flexibility provided by the mobility of the iPad. For example, during an interview one parent noted:

We love that *Johnny* [participant 5] can use the iPad in the car while we are driving somewhere or while we are waiting for his sister at school. It gives us a break and he seems to enjoy it. Now with the apps you have us using it feels like he is actually learning something too.

Most of the children initiated using the language apps by asking their parents for permission to “play on the iPad.” In addition, daily routines were used frequently, including: driving time, afterschool rituals, bedtime rituals, and pre-dinnertime rituals. Similarly, four of the seven sets of parents established limitations for “iPad time” (e.g., no more than an hour per day). The following quote taken from the parent of participant 3 further demonstrates these rituals and limitations:

It got to the point where she would ask so much to use the iPad that we made a rule for how long or how many times she could play on the iPad each day. Like most things with a 5-year old I tried to make a daily routine out of using the iPad. About 30 minutes before dinner each day I had her sit down to play.

Overall, the seven participants averaged 23 minutes of iPad time per day and five days of use per week. It is also important to note that, except for downloading the apps, done by the parents, the children were capable of navigating the iPad and its apps without substantial assistance. One parent indicated, “Very rarely, if at all, did I have to help him with anything while he was playing on the iPad.”

Also, through observation and the accounts taken from the parents and the children, the children appeared to enjoy using the Spanish apps. Participant 1 noted, “I love playing on the iPad. I love the game with the bubbles, because you can pop them.” Likewise, participant 6 indicated, “I like the iPad because you can touch it and move things around when you are playing.” These direct quotes taken from the children also aid in addressing research question 2, identifying the common characteristics of the preferred apps. Overall, the children preferred the apps that were more game-like. Consequently, it is also important to note that, throughout the transcriptions of interviews with the children and their parents, the word *play*, or a variation thereof, was iterated 39 times. All of the children indicated they preferred Bilingual Child and Bilingual Child Bubbles to the others, because they required the children to actively touch the iPad screen. Each of these apps, depicted in Figures 1 and 2, is also based on progressive levels of difficulty, a common characteristic of gamification in education (Nah, Telaprolu, Rallapalli, & Venkata, 2013).

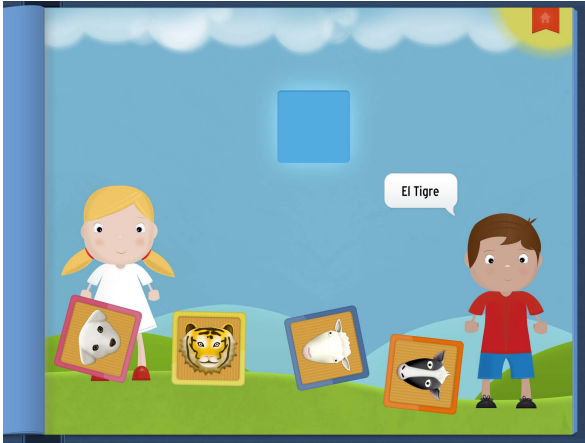


Figure 1: Screenshot of Bilingual Child.



Figure 2: Screenshot of Bilingual Child Bubbles.

Findings for research question 3

To what extent do the children demonstrate increases in animal vocabulary recall as a result of participating in independent iPad-based language learning?

Each of the participants displayed low prior knowledge or recall of animal vocabulary in Spanish. The average pretest score was 1.71 out of 23 (7.43%, $SD = 3.40$). As Figure 4 indicates, five of the seven participants were unable to accurately identify any of the 23 vocabulary items. It should also be mentioned that one of the two children (participant 1) with prior linguistic exposure scored notably higher on the pretest (9 out of 23 items) in comparison to

the rest of the participants. This difference was explained by her participation in a previous preschool Spanish program prior to participating in this study.

Subsequently, after participating in a six-month period of independent iPad-based language learning, the children completed an identical vocabulary recall posttest containing the same 23 animal vocabulary words and images. Overall, the participants experienced an average increase of 11.15 vocabulary items (see Figure 3). A paired sample *t*-test revealed that there was a significant difference in the scores from the pretest ($M = 1.71$, $SD = 3.40$) and the posttest ($M = 12.86$, $SD = 3.34$); $t(6) = 11.89$, $p = < 0.0001$. The effect size was quite large ($r^2 = 0.96$) indicating that the means are likely very different. At this time both participants with prior exposure to Spanish (participants 1 and 2) scored higher on the posttest (17 of 23 items). In addition, participants 3 and 6 made notable increases in vocabulary identification, respectively, from zero to 14 and zero to 13. On the other hand, participant 1, who had previous exposure to Spanish, only improved from 9 items successfully identified to 17, which was less than the gains experienced by the other participants.

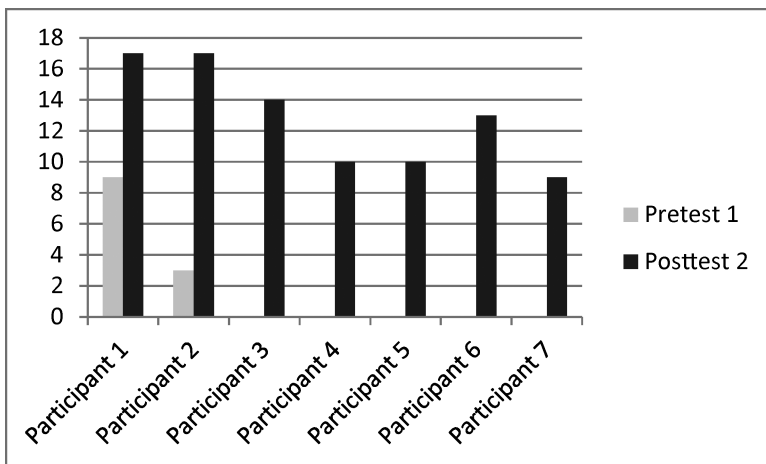


Figure 3: Pretest and posttest scores for vocabulary recall.

Findings for research question 4

To what extent are preschool-aged children capable of demonstrating increases in listening comprehension for animal vocabulary as a result of participating in independent iPad-based language learning?

Similar to the results for vocabulary recall, the pretests indicate that most of the participants displayed minimal understanding of Spanish in a listening comprehension task with regards to the 23 animal vocabulary items. A paired sample

t-test revealed that there was a significant difference in the scores for the pretest ($M = 1.71, SD = 3.40$) and the posttest ($M = 12.86, SD = 2.79$); $t(6) = 15.06, p < 0.0001$. As for research question 3 above, the effect size was quite large ($r^2 = 0.97$) indicating that the means are likely very different. As Figure 4 indicates, five of the seven participants demonstrated no comprehension of the 23 vocabulary items. As noted with vocabulary recall, one of the two children with previous exposure to Spanish (participant 1) also scored higher on the listening comprehension pretest (9 out of 23 items) and posttest (18 out of 23 items). Overall, the participants experienced an average increase of 11.15 vocabulary items.

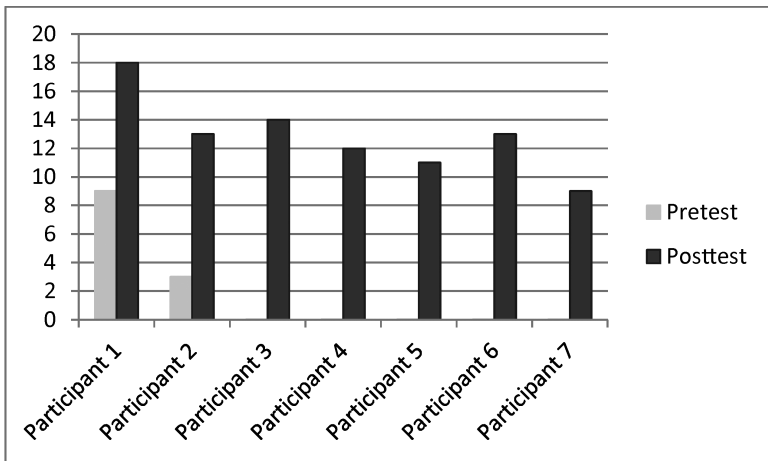


Figure 4: Pretest and posttest scores for listening comprehension.

Discussion

The purpose of this study was to investigate the nature of independent iPad-based language learning by preschool-aged children and the effects on their vocabulary recall and listening comprehension related to Spanish animal vocabulary. The results indicate that the children were capable of navigating the iPad and its apps without substantial assistance, and they experienced the flexibility often provided by MALL (Chinnery, 2006; Godwin-Jones, 2005). The parents successfully used daily rituals or routines to encourage their children to engage with the language learning apps on a regular basis. Findings related to the children's preferred apps and their defining characteristics appear to support the strand of CALL research associated with digital game-based learning (Prensky, 2001), which indicates a general preference for game-like and interactive activities that also progress in difficulty (deHaan, Reed, & Kuwada, 2010), yet are not too challenging as to maintain a "challenge-skill balance" (Song & Zhang, 2008). This also

supports the idea that gamification in language learning may serve as a motivating factor.

In addition, the children demonstrated gains in vocabulary recall and listening comprehension. Such gains have also been reported in the limited, previous research with this age group (Mayoral et al., 2012; Yildiz, 2012). Overall, this study supports the use of iPads as a viable solution to offer language-learning opportunities if others are not available and perhaps to support existing programs that have limited resources. For example, although the sample size of this research is small, the participants, with no previous exposure to Spanish (participants 3–7) and limited previous exposure (participants 1–2), benefited from utilizing the language learning apps for learning vocabulary items. This finding also falls in line with previous MALL research, which has demonstrated the capability of mobile devices to supplement traditional forms of F2F language learning (Browne & Culligan, 2008; Saran & Seferoglu, 2010; White & Gillard, 2011).

Limitations

When considering the overall impact of this research, there are several limitations of this study. First, based on the small sample size ($n = 7$) and the parameters of the study, the findings of this case study are not readily generalizable to other contexts and age groups. Second, and perhaps most importantly, time on task is a significant factor in this study. While a six-month period was suitable for the case study approach and to gather sufficient data to depict the phenomena of iPad-based language learning, the prolonged time period skews the meaningful value of the results related to gains in vocabulary recall and listening comprehension. Third, the apps used throughout this study were limited to vocabulary-based content. Therefore, the results are also not generalizable to other linguistic skills such as grammatical accuracy or oral proficiency. Last, although field observations were conducted in which the researcher directly observed the children playing on the iPads, much of the data, including the activity logs and the interview responses, were self-reported or reported by parents.

Conclusion

Perhaps most importantly, this study provides direction for future research with preschool-aged children, which is underrepresented in MALL research. Overall, the study was successful in determining that, with the help of daily rituals and guidelines established by their parents, preschool-aged children were able to utilize mobile apps for educational purposes. In addition, based primarily on the flexibility of time and space, the use of the iPad appeared

to expand opportunities for language learning by bringing language-rich and game-like materials into the homes of the participants. The present study also helped to identify locations where the participants commonly used the iPads for independent language learning, primarily at home and in the car. Without the iPads these children would have had more limited opportunities for exposure to Spanish. Likewise, the flexibility to learn Spanish vocabulary at home is especially valuable. Furthermore, having access to Spanish-based iPad apps enabled the participants to make moderate gains in vocabulary recall and listening comprehension. However, the nature of the apps, based on research observation and participant descriptions, did not appear to support learning that could reasonably be extended beyond vocabulary acquisition without additional assistance.

Although a review of the findings of this study has answered some initial queries, it has simultaneously raised additional questions. In addition to continuing with the established line of research related to vocabulary recall and listening comprehension, future research should include a focus on more detailed analysis of participants' favored apps with respect to their features. If patterns emerge regarding features among the preferred apps, additional research could be informative. Additionally, such research could investigate whether apps are suited for building linguistic skills other than vocabulary acquisition. The results of this study clearly indicate gains in vocabulary acquisition. There is also a need to further investigate the role of time on task with regard to making gains in vocabulary recall and listening comprehension. It is probable future studies could document comparable gains with less time spent utilizing the apps. Similarly, future researchers should consider working with larger sample sizes to further document any statistical significance of such gains.

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Appendix A: Background survey

1. Parent's educational background
 - a. Mother _____
 - b. Father _____
 - c. Other _____

2. Parent's linguistic background
 - a. Experience with learning Spanish
 - i. Mother __ Yes __ No
 - ii. Father __ Yes __ No
 - iii. Other __ Yes __ No

3. Child's age ____

4. Does your child have any experience with learning Spanish? __ Yes __ No
 - a. If yes, please describe _____

5. Do you own an iPad, tablet or other mobile device? __ Yes __ No
 - a. If not, are you willing to purchase one for the sake of participating in this study?
__ Yes __ No

6. How many hours each week does your child normally spend using this mobile device?
 - a. __ 1–2 hours
 - b. __ 3–5 hours
 - c. __ 6–10 hours
 - d. __ 11 or more hours

7. Do you feel your child is able to navigate new apps without instruction? __ Yes __ No

8. List three adjectives that you feel describe your child.
 - a. _____
 - b. _____
 - c. _____

9. What are your child's strengths? _____

10. What are your child's weaknesses? _____

Appendix B: Interview questions

*These are the initial questions posed to the parents. Follow-up questions were added as needed. Adaptations to the questions were made when posed to the children.

1. In broad terms can you tell me how things are going with the iPad experience?
2. Where do you feel your child uses the iPad the most? Why do you think s/he chooses this location?
3. When do you feel your child uses the iPad the most? Why do you think s/he chooses this time?
4. How have you verified that the child is using the language apps that have been downloaded when s/he is using the iPad?
5. How would you describe your child's activity with language learning on the iPad? Do you think your child enjoys using the downloaded apps? Can you explain why you feel this way by providing specific examples?
6. Could you describe which of the downloaded apps you think your child prefers? Why do you think s/he prefers this/these app(s)?
7. How long does your child typically use the app(s) at a given time?
8. Do you feel your child is learning the vocabulary items presented in the apps? Can you explain why you feel this way by providing specific examples?
9. Is there anything else you would like to add about your child's experience?

Appendix C: iPad activity log

Day/date	Start time	Finish time	Hours/min. on task	App selected	Location

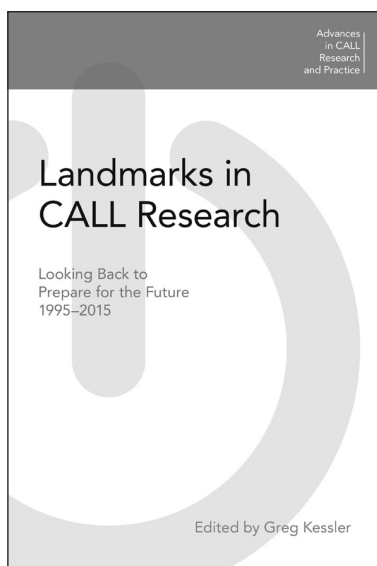
Appendix D: List of animal vocabulary items

Animal vocabulary items	
Buey	Oso
Caballo	Oveja
Cerdo	Pájaro
Cocodrilo	Pato
Conejo	Pez
Elefante	Perro
Gallo	Pingüino
Gato	Rata
Jirafa	Serpiente
León	Tigre
Mico	Vaca
Mono	

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