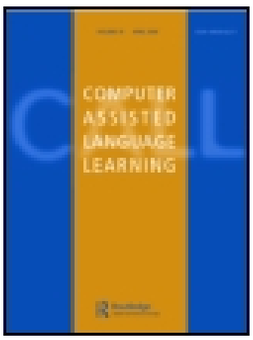

Computer Assisted Language Learning

ISSN: 0958-8221 (Print) 1744-3210 (Online) Journal homepage: http://www.tandfonline.com/loi/ncal20

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To cite this article: Jia Li, Jim Cummins & Qizhen Deng (2017): The effectiveness of texting to enhance academic vocabulary learning: English language learners' perspective, Computer Assisted Language Learning, DOI: 10.1080/09588221.2017.1366923

To link to this article: http://dx.doi.org/10.1080/09588221.2017.1366923

Published online: 22 Aug 2017.

COMPUTER ASSISTED LANGUAGE LEARNING, 2017
https://doi.org/10.1080/09588221.2017.1366923

Routledge
Taylor & Francis Group

The effectiveness of texting to enhance academic vocabulary learning: English language learners' perspective

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ABSTRACT

This study examined university undergraduate English language learners' (ELLs) perspectives on an intervention, *Word Matters*, that aimed to enhance functional academic vocabulary learning critical to their cognitive academic language proficiency development (Cummins, 1989), a challenge faced by many ELLs in English-medium universities. This intervention provided undergraduate ELLs with instructional support of their vocabulary learning through the use of texting. It focused on their acquisition of academic and low-frequency words that appeared in the readings assigned by two content-based English for academic purposes (EAP) courses required for ELLs at a large Canadian university. The intervention was aligned with the lesson plans of the courses. Data in this study were collected from follow-up interviews (n = 10) and a post-treatment survey (n = 40) from a total of 48 students who participated in the intervention. The results revealed students' overall positive experience with the intervention, the feasibility of the intervention design and its effectiveness in supporting ELLs' vocabulary learning. The findings, students' suggestions for improving the intervention, and directions for future research are discussed.

KEYWORDS

University English language learners; text messages; academic vocabulary acquisition; learners' perspective

Introduction

Knowledge of academic vocabulary is critical to developing the literacy skills required for comprehending literature and informational texts and writing academic papers packed with complex concepts (DiCerbo, Anstrom, Baker, & Rivera, 2014; Snow & Uccelli, 2009; Townsend, Filippini, Collins, & Biancarosa, 2012; Wallace, 2008). It is a challenge for English language learners (ELLs) to acquire academic words that 'appear frequently in academic contents across disciplines, but rarely occur in oral conversation' (Lesaux, Kieffer, Kelley, & Harris, 2014, p. 1160). Researchers and educators are well aware that limited vocabulary

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knowledge is one of the major difficulties faced by university ELLs (e.g. Francis & Simpson, 2009), who simultaneously have to improve English language skills and comprehend academic content knowledge. Research on second language (L2) vocabulary acquisition faces numerous challenges in achieving conclusive results concerning effective vocabulary instructional interventions for ELLs. This partially is due to the complexity of academic vocabulary knowledge itself, the vast vocabulary size ELLs have to acquire within a relatively short period of time in order to catch up with native English-speaking peers, and limited direct instructional time in intensive English preparation (IEP) programs.

In recent years, the development of mobile technologies has encouraged researchers and educators to explore the use of texting via Short Message Service (SMS), Multimedia Message Service (MMS), or mobile emails to help L2 students at the high school and university level learn different aspects of language, including vocabulary and idioms (e.g. Cavus, & Ibrahim, 2009; Hayati, Jalilifar, & Mashhadi, 2013; Kennedy & Levy, 2008; Lu, 2008; Thornton & Houser, 2005). The brief, instant, and easy-access nature of text messages, which enable incremental information processing, would seem to be very compatible with the vocabulary acquisition strategy of spaced, multiple word exposures (Dempster, 1987; Hulstijn, 2001; Nation, 2001; Schmitt, 2008).

While the existing research provides some valuable preliminary insight into students' perceptions of mobile platforms (e.g. Stockwell, 2010), texting formats (e.g. with or without pictures) (e.g. Chen, Hsieh, & Kinshuk, 2008), texting content (e.g. Levy & Kennedy, 2005), and texting features (e.g. timing) (e.g. Lu, 2008; Thornton & Houser, 2005), this area of research is still in its infancy. We need further understanding of students' experiences and perspectives, which can inform the design of interventions for vocabulary acquisition, in particular the content of text messages, as suggested by Levy and Kennedy (2005). In this qualitative study, we focused on university ELLs' perspectives on an intervention, *Word Matters*, which aimed to enhance their academic vocabulary. In an attempt to bridge the gaps in previous studies, the design of this intervention was guided by important vocabulary acquisition principles and aligned with key features of text messages.

Literature review

To investigate university ELLs' perspectives on the effectiveness of a texting-based vocabulary intervention, we reviewed two strands of literature. The first provided us with theoretical insights and empirical evidence to develop a data-driven intervention with scientific rigor. The second enabled us to identify two gaps: one in previous intervention designs and the other in research methods that investigated students' perspectives on the interventions. These intricately connected gaps led directly to the four research questions we proposed for the study.

Academic vocabulary and university ELLs

Academic vocabulary has long been considered essential for the development of English language skills and academic achievement (Anderson & Freebody, 1981; Dale, 1965; Kieffer, Petscher, Proctor, & Silverman, 2016; Lesaux et al., 2014; Nation, 2001). Independent learning from reading is essential for college students (Lei, Bartlett, Gorney, & Herschbach, 2010) simply because university instructors have little classroom time to delivery all that needs to be learned. Academic vocabulary knowledge is directly associated with reading comprehension, as not knowing word meanings can hinder or mislead the processing of concepts in reading text (e.g. Cromley & Azevedo, 2007). Undergraduate students with sufficient vocabulary knowledge can immediately proceed to using reading strategies to deal with academic texts instead of expending mental resources on deciphering the meanings of certain unknown or unfamiliar academic words (Cromley, Snyder-Hogan, & Luciw-Dubas, 2010).

For university ELLs, the lack of sufficient vocabulary knowledge is perhaps the biggest challenge in trying to comprehend academic content and succeed in university studies (Laufer, 1997; Lesaux et al., 2014; Perin, 2013; Wallace, 2008). It is estimated that native English speakers have a vocabulary of about 50,000 words when they enter university (Stahl & Nagy, 2007). The Test of English as a Foreign Language (TOEFL), which requires a vocabulary of only 4500 words, is commonly used by Canadian and US colleges and universities as an admission requirement to evaluate ELL applicants' ability to understand and use English in academic settings (Chujo & Oghigian, 2009). It can be concluded that when many ELLs enter university, their average vocabulary size is a fraction of that of native speakers.

Previous research on vocabulary instructional strategies provided us with three theoretical insights for our design of a texting-based vocabulary intervention. Vocabulary acquisition is a complex and incremental process (Schmitt, 2008). *First*, a spread out, incremental input of vocabulary instruction could alleviate students' cognitive load, creating a spacing effect that efficiently 'enhanced learning during spaced as compared with massed study episodes for a given item' (Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006, p. 354). *Second*, Nation (2000, 2001) and Schmitt (2008) pointed out that providing repeated exposures to target words over time in a principled manner in various contexts should be designed as a part of vocabulary intervention programs, or else students are likely to forget words. *Third*, students should be provided with opportunities that are conducive to both intentional and incidental vocabulary learning (Hunt & Beglar, 2002; Krashen, 2004; Nation, 2000), and perhaps the best way of incidental vocabulary learning through authentic reading text is by previewing it and 'reinforcing it afterwards with intentional learning tasks' (Schmitt, 2008, p.352). Furthermore, vocabulary is best acquired through comprehensible input (Krashen, 1982, 2004). For example, if target words are explained by definitions

and sample sentences with other simpler and known words, students will likely learn the target words. To enhance ELLs' learning of academic vocabulary, innovative interventions, focusing on comprehensible, incremental input and repeated exposures, are needed to facilitate seamless learning across a variety of formal classroom instruction and informal self-regulated learning settings.

Previous studies on vocabulary instructional interventions using text messages

A growing body of research in mobile-assisted language learning (MALL) has examined interventions designed to improve vocabulary learning and instruction (e.g. Burston, 2015; Stockwell, 2007, 2013). A few studies specifically investigated the effect of texting on high school, university and other adult L2 students' learning of vocabulary and idioms, and reported learners' positive feedback and intervention effects (e.g. Cavus & Ibrahim, 2009; Hayati et al., 2013; Levy & Kennedy, 2005; Lu, 2008; Thornton & Houser, 2005). Several distinctive aspects of the findings were revealed in these studies that provided further valuable empirical evidence to guide our intervention design. *First*, most previous texting-based interventions used a 'push' mode (Stockwell, 2010) or one-way texting communication with message content and schedules being set by teachers or researchers. The server sent L2 learners information at predictable time intervals compatible with their daily routines in order to facilitate word learning. *Second*, the underlying principle of these instructional designs aimed at providing learners with frequent, structured exposures and spaced repetitions of target words. *Third*, most interventions focused on explicit and comprehensible instruction – text messaging learners the definitions of target words and sample sentences. For example, Levy and Kennedy (2005) conducted a seven-week case study to explore the timing and number of repeated messages, as well as the nature of the recall prompts, with Australian university students who learned Italian vocabulary via SMS messages through mobile phones. The content of their messages, including new words, definitions and example sentences, was sent at appropriately spaced intervals between scheduled class meetings. Their results showed that most students enjoyed receiving messages, preferably two to three messages per day between 9:00 and 6:00 pm. Kennedy and Levy (2008) further examined the acceptability of the push mode and found that students often perceived the message content to be enjoyable and useful.

Thirteen of the 15 experimental and quasi-experimental studies on English vocabulary interventions using texting that we were able to locate employed the push mode, providing learners with definitions in either English or the first language (L1) of ELLs, and English sample sentences (see details in Li & Cummins, in press). For example, Cavus and İbrahim (2009) used SMS text messaging to help Turkish undergraduate students learn English words. A total of 48 messages, including target words and definitions in Turkish, were sent to students

three times over nine days. The results showed a significant improvement in the knowledge of target words. The survey results indicated that students had a 'highly positive opinion' of the text messages that transformed their learning, making it enjoyable, which both facilitated and motivated their vocabulary learning. Students expressed strong interest in continuing to use text messages in other classes in the future. Also, in a 20-day experimental study by Hayati et al. (2013), Persian-speaking Iranian ELLs received four SMS messages per day, each including an idiom with its definition and an example sentence in English. Their results showed a better learning gain through SMS than with a self-study printed pamphlet of equivalent material, or contextual learning in which idioms were introduced in short passages.

Though these previous studies indicate that overall texting-based instruction leads to greater learning growth compared with self-paced paper- and web-based instruction, research findings on students' perspectives are preliminary. We have identified two intertwined aspects of gaps in these studies that warrant further investigation – the lack of the interventions developed with key acquisition principles and instructional strategies, and the lack of thorough examinations of students' perspectives on texting-based interventions. *First*, most of the previous studies had a short duration of less than a month, as noted above. This could be problematic, as instruction for spaced, incremental word learning that lasts for extended periods of time is more beneficial than that of short durations (Cepeda et al., 2006). Learners cannot be expected to report appropriately on their learning experience after such short-term interventions. *Second*, the existing literature reported mixed results on students' perceptions of texting-based vocabulary interventions. On the one hand, students (e.g. Taiwan high school ELLs in Lu's (2008) two-week study) appreciated the greater flexibility of using ubiquitous and convenient text messages to learn words anywhere, anytime, which enabled them to memorize vocabulary more easily; on the other hand, some students (e.g. many Japanese college ELLs in Thornton and Houser's (2005) two-week study) were found to procrastinate in reading the messages. Levy and Kennedy (2005) also reported that only one-third of their students perceived repeated messages as useful. Additionally, research has found that learners' preferences varied in terms of the frequency and timing of receiving messages (e.g. Cavus & İbrahim, 2009; Kennedy & Levy, 2008). *Third*, few studies addressed students' perceptions of how texting-based vocabulary instruction was integrated and how target words relevant to their learning context were selected. Levy and Kennedy's (2005) study selected target words from a required novel, and their student participations indicated their preference for messages that were not only easy to understand but also in line with course content (e.g. the novel's grammar, difficult words). *Fourth*, previous studies reported primarily on students' perspectives on texting features, but the cognitive benefits of learning words through texting were only briefly or not reported. For example, Zhang, Song, and Burston (2011) reported that SMS messages helped their

participants use brief spare time effectively to learn words conveniently (i.e. mobile and light-weight) through regular, less demanding mini-tasks, though they felt the number of long messages received could be overwhelming (i.e. two messages daily with five words per message for 26 days). Students in Lu's (2008) study reported that SMS content was manageable (i.e. short and easy to read, clearly presented) but insufficient (e.g. no example sentences/phonetics). These results were inconclusive, as researchers did not report the details of the content and its development; moreover, some results indicated that students 'seemed to be more concerned with the convenience of the medium than the content of the SMS lessons' or the learning activities (Lu, 2008, p. 522). It is clear that research is needed to solicit students' perception of content development for texting-based vocabulary instruction.

Fifth, no studies have explicitly addressed students' opinions on the tailored instruction of academic words in meaningful contexts, though there were a couple of studies on the training of academic words taken from a vocabulary book (Derakhshan & Kaivanpanah, 2011) or the TOEFL (Zhang et al., 2011). *Sixth*, previous studies were all conducted in the context of learning English as a foreign, not a second language (EFL not ESL) in which a significant number of international and domestic ELL students struggle with specific content areas due to limited academic language skills. *Finally*, the existing literature often reported students' perspectives through surveys on predetermined items or anecdotal evidence. Alternative research instruments, such as interviews, would be more helpful to gain in-depth understanding of students' needs in order to optimize texting-based vocabulary instruction. Thus, the present study explored university ELLs' experiences and their in-depth perspectives on a texting-based vocabulary intervention that was developed to bridge the gaps addressed above.

Research questions

To address the concerns discussed above, we developed a vocabulary intervention using texting, *Word Matters*, to answer the following four research questions (see below for the detailed explanations of the intervention design):

(1) What are university ELLs' perspectives on the features of the intervention design?
(2) What are university ELLs' perspectives on the intervention content (i.e. content of text messages)?
(3) What are university ELLs' perspectives on the effectiveness of the intervention's use of texting to enhance their academic vocabulary learning?
(4) What are university ELLs' suggestions for further development of the intervention using texting to enhance academic vocabulary teaching and learning?

Table 1. Background information of students interviewed ($N = 10$).

Name	Sex	Age	Grade level	Major	English instruction (years)	Time in Canada (years)	L1	Country of origin
Morgan	F	18	1st	Law and Society	11	1	Russian	Russia
Jason	M	22	1st	Economics	10	2	Chinese	China
Joy	F	19	1st	Business	8	0.6	Chinese	China
David	M	20	1st	Computer Science	8	2.2	Turkish	Turkey
Jen	F	19	1st	Business	10	0.6	Chinese	China
Diane	F	20	1st	Economics	10	0.4	Chinese	China
Sarah	F	21	2nd	Psychology	11	1.2	Chinese	China
Mike	M	21	1st	Business	9	1	Chinese	China
Lili	F	20	1st	Economics	10	0.6	Chinese	China

Methods

The present study was part of a larger quasi-experimental intervention study that examined the effect of texting on ELL students' academic vocabulary learning at a large Canadian university.

Participants

Data were mainly collected from follow-up interviews with 10 participants (20.83% of the treatment sample size). We invited 12 potential participants by selecting every fourth student from the treatment group list ($n = 48$) based on the alphabetic order of their surnames (see Table 1 for details). Two participants were unable to participate in the interview due to time constraints. The high percentage of Chinese ELLs in the study, mostly international students, was proportionally consistent with the overall country-of-origin distribution among ELL students at the university where the participants were recruited.

Additionally, two short surveys were conducted. A pre-intervention survey was administered to 30 students to collect their background information and identified a feasible technology medium (i.e. texting) to deliver vocabulary instruction. For data triangulation and to provide additional information to interpret and confirm the interview results, a post-treatment survey with 40 students investigated their learning behaviors and perceptions of the intervention's features and content. In the pre-intervention survey, the participants reported on a five-point scale[1] their frequency of technology use, suggesting the highest frequency for text messages, followed by email, Facebook, WeChat, Twitter, and other social media.

Instrument development and data collection

The interview questions, pre-intervention survey, and the post-intervention survey were developed by the core research team composed of one researcher and two graduate research assistants. With input and feedback from two of the EAP course instructors and other research team members, revisions were made to

ensure the clarity and relevance of the questions from the student participants' perspective, and the organic progression of the discussion during the interviews (see Appendices 1 and 2). The surveys were administered in the class for 15–20 min by the course instructors and a researcher or research assistant. The post-intervention survey consisted of 11 questions to collect information about students' experience with the intervention and one open-ended question to solicit their suggestions. The interviews were conducted immediately after the completion of the intervention in either English or Chinese by the two graduate research assistants by phone or Skype. Each interview lasted from 30 to 90 min. Eight interviews in Chinese were audibly translated into English and then transcribed verbatim along with two interviews in English. Pseudonyms were used for all participants; their country of origin was preserved with their consent. Both interview and post-intervention survey focused on two major aspects of the students' perspectives: (1) the effectiveness of the intervention, including its design (e.g. timing, frequency, types of instruction via mobile-assisted text and web-based email messages) and content (e.g. the difficulty level of target words, number of words and example sentences) in enhancing their vocabulary learning, and (2) their preferred methods and features in learning academic words using text messages.

Intervention design and procedure

Given the limitations of the previous studies discussed above, the objective of this study was, through semi-structured interviews, to examine ELLs' perspectives on a rigorous two-month intervention, *Word Matters*, and to gain in-depth understanding of their perception of the efficacy of the intervention, specifically the features and content of text messages. The intervention design was guided by five principles to optimize students' academic vocabulary learning (see Li & Cummins, under review for a detailed description).

- *A push mode of texting communication.* The model can facilitate the spaced delivery of text messages at predetermined time intervals and provide students with multiple, repeated exposures to target words and encouraging incremental learning.
- *A combination of a longer duration and balanced frequency of instruction.* To address the short durations of instruction treatment and lack of consensus on texting frequency reported in the existing studies, this two-month intervention provided ELLs with instruction using text and email messages for daily, weekly and monthly exposures and reviews of target words.
- *Contextualizing content design*. We chose meaningful target words from required readings of the EAP courses that the participants took during the intervention. This design is aligned with student needs and curriculum requirements to maximize both intentional and incidental learning of academic vocabulary.

absorb
Crow Lake p. 3
v. to have the full attention, interest
I was so absorbed by her story that I forgot about time.

incorporate
Aboriginal Peoples p. 114
v. to cause to combine together into a united whole
This design incorporates the best features of our earlier models.

prioritize
Why Can't We Talk? p. 124
v. to arrange in order of importance
It is always difficult to prioritize work, school and family.

Figure 1. Sample text messages.

- *A careful selection of high-usage target words*. We used Cobb's (2016) VocabProfilers to select a total of 200 academic and low-frequency words that were critical for their comprehension, appeared multiple times in their assigned readings, and would likely appear in a variety of academic domains (Coxhead, 2000).
- *Providing comprehensible instruction of vocabulary acquisition*. To ensure comprehensible input, word definitions and example sentences were crafted meticulously using simpler words that we considered were more relevant to the students' daily lives.

Volunteers from three ELL classes were randomly assigned to the treatment group (n = 48) and the other three classes to the control group (n = 60). Based on the university admission requirement (e.g. iBT 80+, IELTS 6.0+) and vocabulary pretests (Li & Cummins, under review), ELL participants in these classes had an advanced-low language proficiency level (American Council on the Teaching of Foreign Language, 2012). An orientation email explaining the project was sent to ELLs before the intervention started. *Word Matters* taught ELL students 189 of the 200 words over two months using text messages. Treatment included receiving three words each day through text messages: one in the morning, one at noon, and one in the afternoon, following students' preference and in keeping with Dunn and Dunn's (1993) suggestion that students are more receptive to texting-based instruction during the daytime. Each text message included a target word, the page reference of the target word in the reading, the word's definition, and an example sentence (see Figure 1). Every night, students also received an email summary of the three words learned that day and a quiz of the words learned previously in a word-game format. At the end of each week and each month, the students received a downloadable vocabulary summary for review. Meanwhile, the control group learned the words through regular class instruction and independent reading. Both treatment and control groups received pre- and post-tests one week before and after the intervention,

including a 60-item targeted vocabulary level test designed by the research team, the results of which are debriefed in the present article, and reported thoroughly in a separate article (Li & Cummins, under review).

Data analysis

Descriptive analysis was conducted for the 11 questions in the post-treatment survey in terms of range, minimum and maximum values, mean, standard deviation, skewness, kurtosis, and number of cases. The values for skewness were within the range of −1 to 1, and the values for kurtosis were within the range of −2 to 2, in keeping with assumptions for normal univariate distribution (Gravetter & Wallnau, 2016).

Each transcript of the students' interviews was analyzed within the theoretical framework of grounded theory (Glaser & Strauss, 2009), which proposes a conceptually open approach for the emergence of ideas from the data (Strauss & Corbin, 1998). Applying a thematic analysis, we looked across all of the interview transcripts to identify students' individual perceptions and collective experience with the intervention. Using MAXQDA, a professional data analysis software for qualitative and mixed methods, the open coding (Strauss & Corbin, 1998) of the occurrences of students' idea units were categorized and analyzed to examine 'how different ideas or components fit together in a meaningful way when linked together' (Leininger, 1985, p. 60) as different sub-themes and major themes. Collectively, these themes contributed to an in-depth understanding of student participants' experience with and perspective (Taylor & Bogdan, 1984) on the intervention, and with learning vocabulary using text messages. See Appendix 3 for the results of coding and thematic analysis, including (1) theme categories, (2) number of idea units, (3) percentage of idea units of the total idea units coded, and (4) samples of idea units coded from interview transcripts.

Results

First, the results from the survey are reported. Then, the results from the main data source – interviews – are reported in response to the four research questions.

Post-intervention survey results

The results of the post-intervention survey of students in the treatment group indicated that they read the three text messages four days a week and emails about once a week (see Table 2). Participants rated the ease of understanding between fair and easy for target words, definitions, example sentences, and word meanings with the aid of definitions and sample sentences. They reported the intervention was helpful for them to learn vocabulary and do class readings. Participants were also interested in the small word games or quizzes sent in the

Table 2. Students' feedback on the project: post-intervention survey ($N = 40$).

Items	Range	*M*	*SD*
1. How often do you read the three text messages?[a]	1–7	5.00	1.98
2. How often do you read emails sent to you at 8:30 pm?[b]	1–7	4.13	2.05
3. How do you feel about the difficulty level of vocabulary included in the project?[c]	2–5	3.13	0.76
4. Is it easy for you to understand the definitions of words included in the project?[c]	2–5	3.50	0.91
5. Is it easy for you to understand the example sentences of words included in the project?[c]	2–5	3.67	0.77
6. Is it easy for you to understand the meanings of words with the aid of definitions and example sentences?[c]	2–5	3.55	0.71
7. Do you need more than one example sentence for each word? If yes, how many would you need for each word?[d]	1–3	1.54	0.68
8. We are giving you three words each day. Would you like to have more words, less than three words or just three every day?[e]	1–5	2.88	1.20
9. How do you like the small word games or quiz we send to you in the email every day?[f]	1–5	3.44	0.97
10. How helpful is the project for you to learn vocabulary?[g]	2–5	3.41	0.85
11. How helpful is the project for you to do class reading?[g]	1–5	3.03	0.82

[a]1 = never, 2 = one day a week, 3 = two days a week, 4 = three days a week, 5 = four days a week, 6 = five days a week, and 7 = every day.
[b]1 = never, 2 = seldom, 3 = twice a month, 4 = once a week, 5 = three times a week, 6 = five times a week, and 7 = every day.
[c]1 = very difficult, 2 = difficult, 3 = fair, 4 = easy, and 5 = very easy.
[d]1 = 1 (one example sentence), 2 = 2 (two example sentences), 3 = 3 (three example sentences), 4 = 4 (four example sentences), and 5 = 5 (five example sentences).
[e]1 = 1 (words), 2 = 2 (words), c = 3 are just right, 4 = 4 (words), 5 = 5 (words).
[f]1 = not very interested, 2 = not interested, 3 = interested, 4 = fairly interested, 5 = very interested.
[g]1 = not very helpful, 2 = not helpful, 3 = somewhat helpful, 4 = helpful, 5 = very helpful.
Items, 9, 10 and 11 are reverse-coded. .

daily email; they needed one or two example sentences for each word; and the number of daily words/messages they felt most comfortable with was three.

Results of thematic analysis of interview transcripts

To answer Research Question 1 (What are university ELLs' perspectives on the features of the intervention design?), findings from an analysis of the interview transcripts indicate that the intervention was well received by the students. These undergraduate ELLs embraced the idea of using text messages but not e-mail to improve their academic vocabulary learning, which is consistent with the result of the post-intervention survey that they read text messages more often than email. Students' feedback on the design of the intervention was centered on their explicit appreciation of five convenient features of texting (55 units) (see Appendix 3 for sample interview excerpts): acceptable frequency of target words texted daily (16 units), time-saving (11 units), ubiquitous access, including anytime (eight units) and anywhere (seven units), quick access (seven units), and preferred means over email massages (six units).

To answer Research Question 2 (What are university ELLs' perspectives on the intervention content?), in a notable difference from Lu's (2008) finding that students were more concerned with the convenience of SMS than with the intervention's content, in the present study, a large percentage of student feedback focused on the content of vocabulary instruction via text messages (63 units), indicating that the content design significantly affected students' acceptance of

the intervention. Five sub-themes also emerged (see Appendix 3), reporting on (1) helpfulness of sample sentences (22 units), (2) helpfulness of target word definitions (17 units), (3) the need for more than one sample sentence (13 units), and (4) acceptable difficulty levels of target words (11 units).

To answer Research Question 3 (What are university ELLs' perspectives on the effectiveness of the intervention in enhancing their academic vocabulary learning?), the students believed that, overall, the intervention motivated and helped them to learn academic vocabulary as a result of its frequent and repeated word exposures facilitated by the convenience and efficiency of texting. Using text messages to provide input-based incremental vocabulary instruction (Barcroft, 2012) was proven to be feasible. Students' reports on the effectiveness of the intervention were categorized in six sub-themes according to the clustered units coded (115 units, see Appendix 3): the intervention (1) helped enhance their academic vocabulary knowledge, including increasing their vocabulary size and contextual understanding of word meanings (32 units), and it also (2) helped their learning of other aspects of language, including their reading and writing skills (23 units). (3) All 10 students interviewed indicated they either intended to continue participating in the current project or would participate in similar interventions again (21 units). Students provided (4) generally positive feedback on the intervention (20 units), as well as specific comments that the intervention (5) enhanced their learning motivation (10 units), (6) facilitated repeated word exposures, and provided optimal convenience using text messages for incremental learning of target words that are well aligned with assigned course readings (nine units) (see Appendix 3 for sample interview excerpts). Sub-themes 1, 2, and 6 revealed that 19.20% of students' positive comments focused on how the intervention helped them to learn words in context, which is particularly important for their academic reading and writing.

To answer Research Question 4 (What are university ELLs' suggestions on further development of the intervention using text messages to enhance academic vocabulary teaching and learning?), a total of 126 units of student suggestions were coded, accounting for 36.3% of all codes for the study (see Appendix 3). The results reflect students' strong interest in learning words via text messaging, and indicate their belief in its great potential for future development. Six sub-themes emerged focusing on the content of text messages, vocabulary mobile apps via MMS and equipped with multi-lingual dictionaries. These include (1) equipping a mobile dictionary app in texting-based interventions (with features such as pictures, animation, camera search for words, personalized thesaurus, pronunciation, and multi-lingual definitions) (55 units), (2) using MMS for more than just text messages, including images, animation, and gamification (42 units), (3) contextualizing target word instruction with classroom activities and exams (11 units), (4) teaching words and phrases for basic interpersonal communication skills in addition to academic words (8 units), (5) developing personalized and adaptive text messages catering to different levels

of individual language skills (5 units), and (6) developing text-message apps for explicit and intentional vocabulary instruction and learning (e.g. for standardized proficiency tests) (five units).

Sub-themes 1 and 2 contain the majority of the codes, highlighting students' strong interest in integrating diverse multimedia features in texting. Sub-theme 2 indicates students' clear orientation to engage in learning through entertaining means, which is in keeping with how they use text messaging in their daily lives. Sub-theme 1 includes the most codes in the study (15.32%), reflecting a strong trend of self-initiated vocabulary learning in MALL by contemporary ELLs – an overt reliance on bilingual online dictionaries and mobile dictionary apps, which can be developed using MMS and texting apps for the future interventions.

Discussions

The analysis of interview transcripts is discussed in terms of three themes: first for Research Questions 1 and 2, text messaging is a malleable and gratifying means of vocabulary instruction and learning; second for Research Question 3, text messaging supports incremental vocabulary acquisition and related language skills; and third for Research Question 4, suggestions for future interventions: interactive, MMS, and content alignment.

Text messaging as a malleable and gratifying means of vocabulary instruction and learning

ELLs' overall positive perspectives on the intervention features are comparable and, in some aspects, more substantial than previous studies, most of which were conducted at smaller scales with either fewer samples and/or for a shorter duration (e.g. Cavus & Ibrahim, 2009; Lu, 2008; Thornton & Houser, 2005; Zhang et al., 2011). In keeping with the present findings, previous studies indicated students' overall preferences for vocabulary and idiom instruction via text or email messages using cellphones over PCs or paper-based learning activities and materials (e.g. Hayati et al., 2013; Lu, 2008). Similarly, they frequently read text messages (Thornton & Houser, 2005).

It is not surprising that students preferred text messages to email. Because texting allows quick and ubiquitous access using small chunks of time, it appears to be a flexible way to help students learn words. Joy, a first-year student in Business, said, 'Because the text messages are not very long, it won't take a lot of time to read the message…they are much more convenient (than email)' (see Appendix 3). This is consistent with findings from studies involving Hong Kong (Leung, 2007) and US (Grellhesl & Punyanunt-Carter, 2012) university students whose use patterns of SMS and text messages were found to be positively associated with the gratifications of convenience: 'quick' and 'ease of access and mobility.' It also confirmed Lu's (2008) reporting of students' positive comments about learning words using SMS because of its ubiquitous nature and efficiency –

learning words anywhere utilizing their spare time. The students in the present intervention did not mention the entertainment and fun aspects as recounted by students in some previous studies. For example, some students in Lu's (2008) survey indicated that using text message to learn words is novel or fun; similarly, students in Cavus and İbrahim's (2009) study found the mobile learning tool system enjoyable. In addition to non-interactive and one-way text messages in the intervention, this difference might be because the present study did not probe this aspect intentionally in interviews, unlike other studies that used forced answers in surveys.

Most interviewed students explicitly indicated that three target words are in fact the right number of words sent daily, which is supported by the survey results. Lili, a first-year student in Economics, said: 'If there are more words, you might take more time; two may be too few, so I think three is perfect: (one) in the morning, (one) at noon and (one) in the evening.' Nevertheless, three students indicated they would like to learn more words per day, but one student said three words per day was too many. This nine-week intervention aimed at teaching students 189 words, which was significantly longer than Thornton and Houser's (2005) four-week study with Japanese college students who received lessons three times daily to learn five words weekly, Lu's (2008) two-week intervention study with high school students in Taiwan learning 28 words using SMS, Cavus and İbrahim's (2009) nine-day study with Turkish undergraduates using 48 messages, and Zhang et al.'s (2011) 26-day study with undergraduates in China receiving two text messages daily, each with five words. However, the present study was less intensive than Cavus and İbrahim's (2009) and Zhang et al.'s (2011) studies, which intended to teach students more words daily in a short period of time. While the majority of the students in Cavus and İbrahim's (2009) study responded positively to receiving messages on weekends, which also is the case with the present study, interestingly more than half of their participants indicated that they liked receiving the messages every 30 min, a very high frequency, which would not have been acceptable for our participants.

Most interviewed students also explicitly indicated that target words were at the appropriate difficulty level, which is confirmed by the survey results suggesting the word difficulty levels to be fair (i.e. neither difficult or easy). Joy felt the overall difficulty level of target words was 'OK,' citing the combination of familiar and unfamiliar words. Most students highly valued the simplicity and clarity of word definitions and example sentences relevant to their assigned course readings. Two students pointed out that it was critically important for future interventions to continue using simple definitions and example sentences. Students' interview comments echoed the survey results in which they felt the difficulty level ranged between fair and easy for word definitions, sample sentences, and word meanings with the aid of definitions and sample sentences. David, a first-year student in Computer Science, said that definitions were clear to him at least ninety percent of the time; he could understand them, 'so it was good.' The

overall results from both interviews and the survey indicated that the principles underlying our intervention design were successfully realized – to set a reasonable difficulty parameter to challenge students to learn new words through comprehensible input, following Nation's (2001) suggestion in the context of reading that aims to enhance vocabulary learning. That is, for the learning of new words to occur, Nation pointed out that readings should contain a maximum of 5% unknown words, and a minimum of between 1% and 2% unknown words to ensure comprehension and accurate guessing.

Literature reporting students' feedback on the content of text messages for vocabulary interventions is scant. Lu's (2008) study reported that about a quarter of students' negative comments were about the insufficient content of SMS lessons, including the lack of example sentences and phonetics, and students from Levy and Kennedy (2005) suggested adding 'translation in English for hard words' or not making 'the messages too challenging' to improve difficult messaging content (p. 81). Our results clearly indicated that students were satisfied with the comprehensible content of text messages, which they believed to be essential to acquire word meanings, establish word usage, and comprehend assigned readings. They also showed a strong preference for usage-based language acquisition, as 22 units of student comments were about example sentences embedded with target words. That is, they preferred to learn words in context, and 'in doing so they often must comprehend a word in the sense of determining the functional role it is playing in the utterance' (Tomasello, 2009, p. 75).

Effectiveness of the intervention: supporting incremental vocabulary growth

These findings are encouraging, as students said the intervention (1) stimulated their intrinsic motivation – seeing the need to learn these words, which were immediately relevant to their studies, (2) provided them with multiple word exposures, and (3) was aligned with their course content. Jason, a first-year student in Economics, found the intervention helped him to learn more words, particularly difficult synonyms that he did not use often in basic interpersonal communication, which he described in detail below:

> There is one word that I remember very well, *temporary*,[2] which means *lasting for a short period of time*. I did not know this word before this project. I used *current*, *brief* or some other words because they are much easier to remember, but now I know *temporary*, I don't use it often but when I see *temporary* (while reading) I know what it means…I was told by one professor that in writing you need to use different words, more diverse words. For example, if you want to say *show*, one word is *reveal*, also *demonstrate*. I was not able to use any other words besides *show* before. I didn't use the other two words previously, but now I will use them to replace *show*.

Jason further elaborated on his appreciation of how well the intervention was aligned with assigned readings, as it 'provided much easier words to explain

those complicated words,' and texting page numbers of the words in course readings also 'saves a lot of my time' to check unknown words. As a result, 'it's much easier to do the readings now than before.'

Though few studies include in-depth explorations of student perspectives on interventions through interviews, some general positive feedback has been reported which supports our results. For example, most students in Thornton and Houser's (2005) study believed using text messages for vocabulary instruction was a valuable teaching method. Students in Cavus and İbrahim's (2009) study found it very effective to learn new words with a mobile learning tool; and Lu's (2008) survey indicated that students felt text messages enabled them to memorize words more easily.

Students' positive perspectives on the intervention were evident in their target vocabulary test results, which showed that the treatment group gained significantly more vocabulary knowledge than the control group (Li & Cummins, under review). These results are consistent with previous studies in which SMS groups recognized more words or showed a significantly greater word learning gain than control groups (e.g. Lu, 2008; Zhang et al., 2011), and students had a significant increase in word learning after using text messages (Cavus & Ibrahim, 2009).

Finally, all students interviewed expressed a strong interest in continuing the intervention, or would like to participate in similar programs. The students' acceptance and enthusiasm in learning vocabulary using text messages have been well reported in previous studies. For example, most of the Japanese students in Thornton and Houser's (2005) study would have liked to continue word learning using mobile phone email; Taiwan high school students in Lu's study (2008) reported that they looked forward to continuing to learn words using SMS; also Turkish undergraduates in Cavus and İbrahim's (2009) study said they would like to use SMS in coming semesters. With these findings, we can conclude that text messaging is a feasible and effective means of engaging students in vocabulary instruction and learning.

Suggestions for future interventions: interactive, MMS and content alignment

These results showing students' preference for multimedia information input are congruent with Grellhesl and Punyanunt-Carter's (2012) findings, in which US undergraduate students ranked 'entertainment' and 'information seeking' as the third and fourth gratifications of using text messages. Lili believed that the present intervention is 'pretty good,' but if we could make changes to use 'more diverse ways, such as using animation, music, games, etc., it would be better.' This finding appears to differ from Cavus and İbrahim's (2009) study, in which Turkish undergraduate ELLs overall did not show much interest in MMS, with only some students indicating they would like to receive images, animations, or sound effects. Not surprisingly, the present study revealed students' appreciation

of text messaging's socialization aspect in the context of learning; they indicated that interactive text messages would be more fun, interesting, and engaging. Prior to the intervention, when the lead researcher visited the university and met with students in the treatment groups, a few of them asked why they could not text back during the intervention. They were disappointed that they could not interact with the research team. This supports the finding of Cavus and İbrahim's (2009) study – students believed that two-way texting would be more effective for their learning; furthermore, a majority of students suggested integrating chat and forums with the mobile learning system to support text messages.

The results also indicated the great potential of using text messages for self-regulated learning if they are designed as mobile apps that coordinate different features with multiple functions. Jason reported that whenever he had time, he read 'one sentence a day' (a feature from a dictionary app). Sarah, a second-year student in Psychology, described it this way:

> If it (intervention app) also has a feature of camera, you may take a photo of a word, and it can search for the information of the word automatically…The mobile app also has a record of all the words you've searched using the phone.

Students also made specific suggestions concerning the content in sub-themes 3, 4, 5 and 6 which encouraged in-depth coordination and refined alignment with their language skills and their need for support with their school work. Michael, a first-year student in Business, believes that text-message apps should be adaptive, teaching students particular words according to their needs and catering to their individual language skill levels, while Lili would like these apps to further support her preparation for exams and classroom activities. Another interesting finding is that eight out of 10 students asked to include words and phrases for basic conversation skills in future interventions. Pragmatic knowledge of language use is critically important for these new university ELLs. This desire reflects the international background of the majority of the students, who would have had limited opportunities to learn English in social settings. The ten student interviewees had been in Canada for a short period of time, ranging from seven months to one year.

Conclusions

ELLs enrolled in English-medium universities are avid users of mobile phone dictionaries, well aware of the affordances of mobile technology for learning academic vocabulary, and open to MALL instruction apps, and their responses to our intervention were highly positive. Several limitations need to be noted in the interpretation of the present results, which along with student suggestions, entail recommendations for future research. *First*, although the high percentage (80%) of Chinese international students who participated in the interviews was

representative of the country-of-origin distribution of the university's ELL undergraduates, this percentage is somewhat different than the national figure for Canada (33%) (Canadian Bureau for International Education, 2014). It is recommended that future research seek to substantiate the findings with a larger group of ELLs with more diverse backgrounds. *Second*, the study was mainly researcher-led, although the target words were carefully selected from required readings for concurrent EAP courses. Future interventions that encourage a strong researcher–practitioner partnership would further enhance students' learning motivation and inform effective curriculum development for instructors in the classroom. Future interventions using text messages for vocabulary learning that facilitate seamless and organic integrations of intentional and incidental learning will likely lead to greater vocabulary gains. This includes providing students opportunities within a variety of comprehensible learning contexts (Hill & Laufer, 2003; Hunt & Beglar, 2002; Krashen, 2004), i.e. engaging ELLs in vocabulary learning directly supporting their reading and writing requirements for different academic subjects in school and university. *Third*, while according to the currently available literature, this two-month intervention study was one of the longest in this area, interventions with durations of one or two years are needed to examine students' long-term retention of words learned as well as the impact of their vocabulary acquisition on their academic performance. Moreover, future interventions might be designed as apps, enabling two-way interactive MMS, in which students could interact with each other and with instructors and researchers. This opportunity will likely encourage student learning beyond the classroom and lead to more significant learning growth. Finally, the follow-up interviews to seek student feedback occurred one week after the intervention, which might not be adequate to capture the students' experience. For future research, interviews could be administered half way through the intervention so that the details of its effectiveness could be monitored and analyzed, and any necessary adjustments could be made in a timely manner. Additionally, a survey could be administered prior to the interviews, probing student learning behaviors and beliefs.

Despite the limitations, the findings from this study have a number of pedagogical implications. The popularity of texting among university ELLs suggests that EAP programs and other English training programs might consider taking advantage of text messages for an innovative language instruction approach that increasingly appeals to the majority of students. The findings suggest it is feasible to engage students in vocabulary learning by integrating text messaging into classroom instruction. However, a sense of novelty by itself does not necessarily cause learning to occur. Extra attention should be paid to the alignment and convergence of three components when developing curriculum integrating texting, that is, *students' preferred way of texting* enables *carefully developed contents of text messages* that meet *students' immediate learning needs*, thus ensuring the intervention's implementation fidelity, and a high likelihood of promising

learning outcomes. It is critical to design effective texting-integrated curriculum based on considerations such as the simplicity and clarity of text message content, the appropriate number of text messages sent daily, appropriate difficulty level of target words, and words chosen carefully to be aligned with program instructional standards and curriculum.

Notes

1. 5 = more than once a day, 4 = once a day, 3 = once a week, 2 = once a month, 1 = never.
2. Italicized words in transcripts refer to the words that students said in English.

Acknowledgement

We would like to thank students and instructors who participated in this research project.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

Social Sciences and Humanities Research Council, Canada [Standard research grant].

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Appendices

Appendix 1

Sample questions for semi-structured interviews with students

General questions about students' learning vocabulary and/or use of technology

1. For the past two months, we've been texting you and emailing you about new words, how do you like this?
2. Have you ever used your mobile phone to learn English before this project? How do you like using mobile phones to learn vocabulary?

Logistic issues (timing) of the intervention

1. Have you had the time to read all the text messages?
2. How do you feel about receiving text messages or emails at the current time points?

Design and contents of the intervention

1. How do you feel about the words we have texted you, simple or difficult?
2. How do you like the word definitions and sample sentences?
3. Would you like more sample sentences to explain the words better?
4. You have received three words every day. Would you prefer to have more or less than three words every day?

Effects of the intervention

1. Could you please tell us whether or not the project helps you to learn the words, and why?
2. Could you please tell us whether or not this project helps you understand the class readings, and why?
3. Could you please tell us whether or not the project encourages you to learn more words?
4. Could you please tell us whether or not you use words learned in this project in your writing assignments?
5. How do you like the small word game or quiz we sent you in the email every day?
6. Could you please tell us whether or not you will be interested in participating in more similar projects to learn vocabulary in the future, and why?
7. If you are invited to design a vocabulary learning project using text messages or using mobile phones in general, what would it look like? Or do you have any suggestions to improve the project?

Appendix 2

Post-intervention survey

Name: _____
Student ID: _____
Class: _____
Date: _____

With this vocabulary texting project approaching its end, we would like to know your experience. Your feedback is very important for us! Thank you for your time.

1. How often do you read the three text messages?

   a. every day; **b**. five days a week; **c**. four days a week; **d**. three days a week; **e**. two days a week; **f.** one day a week; **g**. never

2. How often do you read emails sent to you at 8:30 pm?

   a. every day; **b**. five times a week; **c**. three times a week; **d**. once a week; **e**. twice a month; **f**. seldom; **g**. never

3. How do you feel about the difficulty level of vocabulary included in the project?

   a. very difficult; **b**. difficult; **c**. fair; **d**. easy; **e**. very easy

4. Is it easy for you to understand definitions of words included in the project?

   a. very difficult; **b**. difficult; **c**. fair; **d**. easy; **e**. very easy

5. Is it easy for you to understand example sentences of words included in the project?

   a. very difficult; **b**. difficult; **c**. fair; **d**. easy; **e**. very easy

6. Is it easy for you to understand the meanings of words with the aid of definitions and example sentences?

   a. very difficult; **b**. difficult; **c**. fair; **d**. easy; **e**. very easy

7. Do you need more than one example sentence for each word? If yes, how many would you need for each word?

   a. 1 is just right; **b**. 2; **c**. 3; **d**. 4; **e**. 5

8. We are giving you three words every day. Would you like to have more words, less than three words or just three every day? Please check the number that you feel comfortable with.

   a. 1; **b**. 2; **c**. 3 are just right; **d**. 4; **e**. 5

9. How do you like the small word game or quiz we send to you in the email every day?

   a. very interested; **b**. fairly interested; **c.** interested; **d**. not interested; **e**. not very interested

10. How helpful is the project for you to learn vocabulary?

    a. very helpful; **b**. helpful; **c**. somewhat helpful; **d**. not helpful; **e**. not very helpful

11. How helpful is the project for you to do class reading?

    a. very helpful; **b**. helpful; c. somewhat helpful; **d**. not helpful; **e**. not very helpful

12. If you have any other comments or questions for us, please write it down below. We appreciate that!

    _____
    _____
    _____
    _____
    _____.

    Thank you very much for your time and participation in our project!

Appendix 3

Results of coding and thematic analysis of interviews focusing on the intervention 'Word Matters'

Themes	No. of idea units	Idea units (%)	Transcript samples
Students' feedback on the feature of text messages	55	15.32%	See samples in the five sub-themes below.
1. Acceptable frequency of texting	16	4.46%	*I think three is good. If there are more words, you might take more time; two may be too few, so I think three is perfect (one) in the morning, (one) at noon and (one) in the evening.* [Lili Hwang]
2. Convenience: Save time, taking advantage of small chunks of time	11	3.06%	*Because the text messages are not long, it won't take a lot of time to read the message. Text messages is much more convenient, but if I checked the emails every few days there would be a lot of emails, so I don't want to read them all.* [Joy Lee]
3. Convenience: Anytime	8	2.23%	*The messages were sent to us a few times every day. Some students might be free now, and other students might be free at some other time, but it really does matter that much, because we can always check the text messages whenever we are free.* [Jen Lin]
4. Convenience: Quick access	7	1.95%	*I read text messages every day, because it is very convenient, and text messages are more practical.* [Joy Lee] *I would take a look (the text messages) as soon as I received it, as long as, uh, I'm not having a class. [Diane Hu]* *Basically, I check the text messages*

(*continued*)

Themes	No. of idea units	Idea units (%)	Transcript samples
			whenever I received them, because I have a text message alert on my phone, so when I received the text message alert I would read it immediately. [Joy Lee] *I would just take a quick look at the emails but not as carefully as I read the text messages. I think the text messages are more convenient, I only checked the emails every few days and for most of the time, just skimming or browsing.* [Joy Lee]
5. Convenience: Anywhere	7	1.95%	*While I was on the bus, I would check the text messages, and it is easy to remember the words.* [Lili Hwang]
6. Convenience: Preference to text messages over email messages	6	1.67%	*I usually use my cellphone, text messages, to learn the words. I don't check the emails a lot because I forgot the emails.* [Lili Hwang] *I just read emails sent by friends or people I know, but for text messages, I read all messages every day. It is much easier to check the messages; it is more convenient.* [Sarah Yang]
Students' feedback on the content of text messages	63	17.55%	See samples in the five sub-themes below.
1. Helpfulness of sample sentences (e.g. simple and clear, learn receptive and productive knowledge of words, sentential grammar, suggestions for more than one sample sentences)	22	6.13%	*When we learn words in school, we just memorize the words, but in the project we have a sample sentence for each word, so when we memorize the words, it is much easier; we can see the sample sentence.* [Diane Hu]
2. Helpfulness of target word definitions (e.g. simple and clear)	17	4.74%	*They [definitions] were clear, like 90% of the time. I understand them, so it was good.* [David Bayrak]
3. Need for more than one sample sentences	13	3.62%	*I feel it's necessary to have more sample sentences, because some of the definitions are too general, it is difficult to have a clear sense of how the words are used, like the form of words, and [to] what context it should be used in real life. So if there are more example sentences, it would be much easier for us to understand the words and its related context, to have a more accurate understanding.* [Lili Hwang]
4. Acceptable difficulty levels of target words	11	3.06%	*There are some words that I'm not very familiar with; there are some other words that I am pretty familiar with, so I feel overall it's OK.* [Joy Lee]
Students' feedback on the effectiveness of the intervention	115	32.03%	See samples in the four sub-themes below.
1. Helped enhance academic vocabulary knowledge (vocabulary size, contextual and in-depth understanding of word meanings)	32	8.91%	*There is one word that I remember very well, temporary, which means lasting for a short period of time. I did not know this word before this project. I used current, brief or some other words because they are much easier to remember, but now I know temporary, I don't use it often but when I see temporary (while reading) I know what it means.* [Jason Chen]
	23	6.41%	*I was told by our previous professor that for writing you need to use different words,*

(*continued*)

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2. Helped other aspects language learning (reading, writing, speaking)			*more diverse words. For example, if you want to express 'show,' one word is 'reveal,' also 'demonstrate.' I was not able to use any other words except 'show' before. I didn't use those two words previously, but now I will use other words to replace 'show' in writing.* [Jason Chen] *Because these words appear in my course readings for school, it is helpful for understanding the reading materials* [Joy Lee]
3. Interest in continuing participation in the intervention or participating in similar programs	21	5.85%	*I would like to participate again, because this is more interesting than learning the words by myself.* [Lili Hwang] *Are there going to be some other projects after this one? I feel it's really good to continue this project.* [Diane Hu]
4. General positive feedback for the intervention	20	5.57%	*I feel that this project is really, really good.* [Jason Chen] *The text messages I was getting during the project, were really, really helpful, so I always… always check my phone.* [Morgan Demidov]
5. Enhanced motivation for learning	10	2.79%	*The text messages and the emails were sent every day; it is very good…, because it reminds me to learn every day, to learn new vocabulary.* [Mike Chen]
6. Facilitated the learning of vocabulary (repeated word exposures, target words well aligned with assigned course readings)	9	2.51%	*This project provided much easier words to explain those complicated words; this kind of method is very good. It's much easier to do the reading now than before. That is for sure, I mean, it also saves a lot of time.* [Jason Chen]
Suggestions for the intervention improvement	126	35.10%	See samples in the eight sub-themes below.
1. To include mobile apps dictionary (with pictures, animation, and camera search for words, personalized thesaurus, authentic pronunciation, and multi-lingual definitions)	55	15.32%	*If it [intervention app.] also has a feature of camera, you may take a photo of a word, and it can search for the information of the word automatically…The mobile app also has a record of all the words you've searched using the phone.* [Sarah Yang] *For example, I usually use two apps for vocabulary learning. One is called Tuoci (拓词). The other one is Baicizhan (百词斩). … Those applications not only have English to Chinese but also English to English, and also they have pronunciations, and sample sentences…and you can click on the link to look at synonyms and other things.* [Lili Hwang]
2. To include multimedia message service (MMS) using images, and animations, gamification	42	11.70%	*I feel this program [intervention] is pretty good, but sometimes it can use more diverse ways such as using animation, music, game, etc. If we can make these changes it would be better.* [Lili Hwang] *To include game in this program is better. For example. I played a game available on Renren (人人网, a social network platform] community. The purpose of the game is to learn English vocabulary. The design of the game is really interesting, so a lot of our*

(*continued*)

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			classmates play the game together and we learned a lot of new words. [Sarah Yang]
3. To contextualize the target words instruction aligned with classroom activities, and exams	11	3.06%	*If there are some more interesting things, like, related to [class] tests and classroom activities that help us learn vocabulary, I would participate because those are very helpful to me.* [Lili Hwang]
4. To add words and phrases for basic communication skills (BICs) in addition to academic words	8	2.23%	*Besides the three words sent to us every day, there could be one more slang word or expression which can be more frequently used in our daily communications…, because a lot of us here aren't fluent at speaking, so we're really hope that we can improve our spoken language, so if there can be some words [that are] more commonly used in speaking in addition to academic words.* [Jason Chen]
5. To develop personalized and adaptive text messages catering to different levels of individual language skills	5	1.39%	*We have different levels of word knowledge. I prefer to learn those words from text messages that I am familiar with but not knowing their meanings. I prefer to learn these words because I will probably use it in the near future and I have a preference to this kind of words.* [Mike Chen]
6. To develop text-message apps for explicit vocabulary instruction and intentional word learning (apps targeting for standardized proficiency tests, word quizzes, one sentence a day)	5	1.39%	*For example, there is one app that I downloaded to my cell phone, and it is called 'TOEFL vocabulary.' Once you click on it, there are some quizzes, and you choose the correct definition of one word or the correct word for one definition [among multiple choices].* [Jen Lin]