

Exploring the use of ARS-keepad Technology in English Vocabulary Development

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Abstract

The lexical approach towards second language (L2) teaching focuses on developing learners' proficiency with lexis, or words and word combinations. Language teachers and researchers are cognizant of the significant role of vocabulary in different pedagogical tasks and of the fact that mastery of vocabulary is an essential component of L2 learning (Mohseni-Far, 2008). An important aspect of L2 vocabulary learning is the capacity to comprehend and produce lexical phrases. This explorative study investigated the role of (Automated Response System) ARS-keepad technology as a pedagogical tool in the second language classroom for L2 vocabulary recognition tasks, and examined whether the technology could be used to utilize a higher level of interaction in the classroom and permit vocabulary comprehension to be assessed in real-time. Studies by cognitive scientist, Pinker (2000) assert that principles of language acquisition can be compared to a branch of theoretical computer science called Learnability Theory, which acknowledges the role of environment in language learning. This premise posits that an interactive instructional environment could play an important role in language learning including vocabulary development. A social learning theory such as the Constructivist theory is also explored in the study to explore whether ARS-keepad technology can promote a higher level of interaction among learners. Initial results from the study illustrate that the knowledge gains, through the use of ARS-keepad technology came firstly from the almost instantaneous feedback from learners to the instructor that facilitated development of relevant vocabulary learning tasks. It further assisted measurement of comprehension through well-designed questions, and by getting each learner to respond. The use of emerging technologies like ARS- keepad in the classroom allows for veering away from traditional teaching paths and learning practices and encourages a more integrated and participative engagement of learners.

Keywords: ARS-keepad technology, vocabulary recognition, L2 language teaching, lexical approaches, vocabulary comprehension.

Introduction

In the lexical approach to language teaching, the lexis is given a more prominent role than grammar. It is based on the idea that an important part of L2 acquisition is the ability to comprehend and produce lexical phrases (Lewis, 1993). Vocabulary knowledge has been identified as the most identifiable component of the learner's ability to read (Nation & Coady, 1988). For this study, the function of an interactive technology such as ARS-keepad technology is analyzed as a pedagogical tool in the second language classroom. The practice of using technology to improve second language (L2) education has a long history (Salaberry, 2001). An appropriate balance of face-to-face teaching and use of technology is recommended in the second language classroom (Sharma & Barrett, 2007). Keepad technology is part of audience response systems or ARS. Keepad-based systems provide group participants with small numeric keypads linked by wireless or infra-red and help participants to key in their responses to questions posed to them by the instructor or facilitator. Although in general, the technology performs a relatively simple function, often limited to a multiple choice pop-quiz, research has revealed that there is more to this technology than meets the eye. Early researchers of ARS-keepad systems have frequently described the technology as a catalyst for a significant, powerful shift in the classroom climate, pedagogy and resulting learning (as cited in Rochelle, 2003). Although the use of personal response technology has increased in in the last decade, it still has not been used extensively in teaching in higher education (Albon & Jewels, 2007). However, more English language teachers have been utilising the use of technological tools, referring to them as significant drivers of social and linguistic change, as it meets both visual and auditory senses of the students (Shyamlee, 2012).

In this study, ARS-keepad technology was applied for advancing vocabulary recognition learning tasks and to validate if it could be used to gain understanding of student vocabulary comprehension in real-time. It is anticipated that this knowledge would enable the instructor to structure appropriate vocabulary development tasks for the learners. This chapter reports on an explorative study conducted to investigate the use of ARS-keepad technology in the language classroom for assessing vocabulary tasks such as word recognition and for developing efficient tasks that assist L2 learners in vocabulary development.

Aims and objectives of the study

The study aimed to investigate the role of keypad technology for the following purposes:

- (1) as a diagnostic tool to assess L2 vocabulary recognition;
- (2) to explore if ARS-keepad technology can assist instructors to increase vocabulary production in L2 learners through structuring academic activities based on responses to recognition tasks.

There were two objectives of the study. There were to:

- investigate the role of keypad technology as an interactive device in the classroom for L2 vocabulary recognition tasks;
- investigate the role of keypad technology to utilize a higher level of interaction in the classroom and allow vocabulary comprehension to be assessed in real-time.

Context of second language vocabulary acquisition

Studies conducted on L2 lexical acquisition in formal instructional settings indicate that the learner benefits from input tuning from the teacher (Krashen, 1981; Ellis, 1994). The present study conducted at an Australian offshore campus in Malaysia reinforces the belief that increased interaction between the learners and the instructor assists in enhanced knowledge and skills. *Interaction* refers to the communication between individuals, particularly when they are negotiating meaning in order to prevent a breakdown in communication (Ellis, 1999). According to Singleton (1999), formal L2 instruction is likely to give the learner more insights into individual lexical items than a naturalistic acquisition environment. The present study is positioned in a formal learning environment.

Word knowledge is an essential component of communicative competence, and it is important for word production and comprehension in a second language (Coady & Huckin, 1997). Learners often lack the capacity to find and use context clues to infer word meaning and may easily discount unfamiliar words or low frequency words. It is also noted that an increase in lexical density of the text may cause learners with low language proficiency to give up trying to construct meaning. The lexical density of a text refers to the proportion of the content words (lexical) in the total number of words in a text (Halliday, 1985). In texts that have a high lexical density, there is an occurrence of more content words. Texts with a lower density are more understood by learners with lower L2 language proficiency and, generally when there is a high concentration of content words, L2 learners tend to comprehend less and may lose interest in reading. Consequently, the less learners read, the fewer the opportunities to acquire new vocabulary. Learning a word requires learning the diverse characteristics of its meaning, and inferring word meaning from context requires the learner to be aware of the diverse characteristics of the context (Mohseni-Far, 2008). Mohseni-Far (2008) believes that the key is to encourage learners to infer meanings of words and provide opportunities to encounter unfamiliar words through multiple exposures to the words. The present study attempts to provide multiple exposures of low frequency words through the use of ARS-keepad technology for better word recognition and learning.

The process of reading texts for meaning undeniably promotes a measure of vocabulary acquisition but, in addition, a whole lot of tasks also need to be developed to utilize written text in a vocabulary learning perspective (Singleton, 1999). The L2 learning process has been identified as a mediated process and it is assumed that students generally benefit from explicit vocabulary instruction in conjunction with reading (Hulstijn, 2000). Hulstijn (2000) also contends that until recently, empirical research on language acquisition and use was restricted to the observation and measurement of language input and output. However with computer-aided tools, researchers have the resources to get closer to the *processes* of language attainment and application. In this study, the researcher has carried out explicit teaching of vocabulary and has attempted to introduce word recognition tasks to the learners through the use of technology n b espouse creating meaning from experience (Jonassen, 1991). Constructivist theories of learning advocate that learners create their own knowledge by analyzing concepts based on experiential knowledge and applying these to new situations integrating the new knowledge gained with pre-existing intellectual constructs or schemas. In the process of (mediated) learning the learner is the active agent (Webb, 2002). Constructivist proponents believe that instruction depends on learners and environments and emphasize the interaction between these influences more than any other learning theories (Schunk, 2000). In the present study, the learners' prior knowledge of

vocabulary is considered significant, and it is premised that learners develop vocabulary in a constructivist manner.

Research studies conducted by cognitive scientist, Pinker (2000) assert that the principles of language acquisition can be compared to a branch of theoretical computer science called Learnability Theory, which acknowledges the role of environment in language learning. This assertion posits that the instructional / interactive environment could play an important role in all aspects of language learning including vocabulary development. Learn ability theory describes learning as a setting involving four parts: a class of languages, one of them being the target language that the learner needs to acquire, an environment in which the learner has to acquire information in the world, a learning strategy in which the learner tries out hypotheses about the target language and a success criterion by which learners may arrive at a hypothesis - identical to the target language after some fixed period of time (Pinker, 2000). This theory is tested in the current study to establish whether L2 learners benefit from a social constructivist classroom environment in which there is interaction between peers and between peers and facilitators in order to develop vocabulary.

In cognitive theory, learning is an active constructive process where the learners select and organize input, relate the input to their prior knowledge, retain what is important and reflect on the outcomes of their learning efforts (Chamot & O'Malley,1993). This theory is similar to constructive theories of learning, the principles of which can be attributed to Jean Piaget, who stated that knowledge is constructed actively by the learner and is not passively received from the environment (von Glaserfeld, 1987). The belief that the learner constructs knowledge vigorously emphasizes that there is a need to raise awareness in learners regarding their prior knowledge of vocabulary which is essential in order for them to actively construct new vocabulary. In the constructivist learning approach, the teacher is a facilitator of collaborative learning. The above discussion establishes the foundation for the current study. The study places importance on the prior knowledge of vocabulary of L2 learners and its motivation on L2 learners to recognize words already familiar with, which in turn influence the acquisition processes in vocabulary development.

In studying vocabulary acquisition, the distinction between *knowing* a word and *using* a word needs to be made (Mohseni-Far, 2008).Vocabulary teaching must incorporate tasks that develop in learners the skill to recall words, and the ability to apply them in a wide range of language contexts, when the situation demands it. It is essential for L2 learners to learn a large number of words and make them part of their mental lexicon for successful word production in context. Academic writing is a challenging skill and absorbs a large proportion of students' study time. It is critical that the students are well-supported in the development of the various tasks assigned to them in the unit and that they develop vocabulary that is pertinent to the needs of the unit and the program. Vocabulary learning and teaching link to reading for receptive understanding of language and writing for its productive use. Studies report vocabulary learning as the most challenging of tasks for students (Jordan, 1997). Given that the researcher's expertise is in vocabulary development, it was deemed significant to employ ARS-keepad technology in the classroom for vocabulary development as part of the students' developmental progress in academic writing as a whole.

Research Methodology

The research methods employed for the present study include three elements: design for data collection, measurement of variables and analysis of data. Both qualitative and quantitative methods were used in the study. The study employs a mixed-method to obtain the relevant data required for analysis and interpretation of the phenomenon being studied. The use of mixed methods is considered most valid for this study as using more than one method allows the researcher to benefit from the strengths of each method. Educational research has been categorized as a systemic process of collecting and analyzing data for a purpose (Wiersma & Jurs, 2005). The research data was gathered initially through ethnographic methods, namely classroom observations and student questionnaires, with provision for open ended responses. Ethnography accepts that human behaviour occurs within a context and that educational activities take place against a background of premises, interests and values concerning teaching and learning and knowledge (Burns, 2000). The researcher maintained a diary for keeping an audit trail of academic activities and for recording the response behaviour of study participants to the introduction of ARS-keepad technology. Chapelle (2004) postulates that qualitative research always involves the study of people and therefore it is invaluable to instructional technology in education, which has to take into account the characteristics of different types of people and communication between different types of people. It is important for an instructional designer to analyze learners and contexts before designing an instructional system (Putney and Green, 1999). Qualitative research provides insights into the emic or insider; the knowledge needed by members of a group to participate in socially and academically appropriate ways (Chapelle, 2004). The present study has considered the background of the learners and the context of learning in order to enhance the rigour required for a research study. Ethics approval for the study was granted through applications made to the R & D office at the university.

The strengths of quantitative research are that it tests and validates already constructed theories about how and why phenomena occur. To strengthen the findings from the qualitative approaches, data was also gathered quantitatively. Triangulation is defined as the use of two or more methods of data collection in a study that focuses on an aspect of human behaviour (Cohen, Manion & Morrison, 2000). A triangulation is a powerful way of demonstrating concurrent validity, particularly in qualitative research (as cited in Cohen, Manion & Morrison, 2000). The audience response system- (keepad) was further used to elicit responses about student perceptions on the use of technology as a pedagogical tool in the L2 classroom, contributing to a quantitative analysis of students' vocabulary proficiency and attitude towards the use of keepad. Data collection using quantitative methods are quick and provide precise, numerical data. The data collected was analyzed to gain an understanding of the efficacy of using ARS-keepad systems as a pedagogical tool for vocabulary recognition tasks, for interactive student engagement and to create tasks that would facilitate comprehension and vocabulary development in learners. A purposeful sampling method was used to select study participants as the groups who participated in the study were allocated to the researcher as part of the workload at the beginning of the study periods and was considered to be the most suitable for the study. A purposeful sample is selected for the specific needs of a study (Cohen, Manion & Morrison, 2000). The duration of the study in which ARS-keepad technology was utilized as a diagnostic tool for vocabulary recognition tasks comprised 14 weeks.

How ARS-keepad system was employed

Academic writing entails students to advocate their positions on various issues, be it environmental, social or ethical, which necessitate them to read journals and relevant articles. Writing expository and argumentative type essays call for analysis and require students to read and understand ideas and key points presented by authors to support theses, and later in their own writing, persuade readers to believe in their viewpoints using logic and reason. In the study, the meanings of words tested for meaning were selected from readings that had been introduced in earlier sessions to the students. Vocabulary questions drawing out word meanings were posed to students using a stem followed by alternative response choices. The stem consisted of an incomplete sentence that elicited meaning of words from a set of four alternative choices. When the question was posed to students on a slide with multiple choice alternatives, they were able to press the alphabet on the handset, from a choice of A,B,C or D to indicate their preferred response. Waring (1999) claims that multiple-choice tests and matching tests are standard ways of carrying out measurement of vocabulary. “Vocabulary assessment in the history of the twentieth century is associated with the development of objective testing” (Read, 2000, p.22). Successfully completing a multiple-choice item is mentally challenging, according to Waring (1999). For example, in order to correctly answer a multiple-choice item, the respondent needs to identify the form and match the form with an entry in the mental lexicon. There is also the process of retrieval and matching process that involves paradigmatic or syntagmatic associations (Waring, 1999). Therefore the selection of multiple-choice questions to measure vocabulary recognition was deemed suitable for the study.

The researcher set up the audience response or keypad system in the classroom that used infra red transmitters, an infra red receiver that collected student responses, and turning point software integrated with PowerPoint. The students were given small handsets with response pads showing alpha-numerical guides (Figure 1).

The graphical interface display showed how many students had responded and indicated when all the students had responded. The responses were collated quantitatively and displayed graphically on the screen in real-time showing students how they responded.

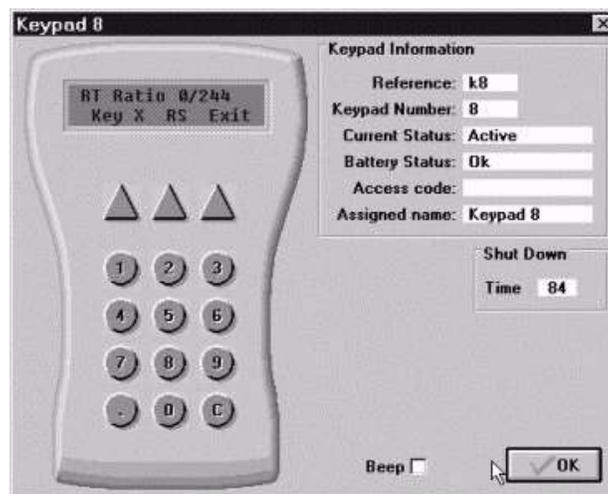


Figure 1: Image of a keypad response pad (Source: Jones, 1999).

Participants and instructional modes

The participants in the study came from two academic writing classes for pre-tertiary engineering and business courses. The groups comprised a total of forty students, both male and female. No attempt was made to differentiate or distinguish between the responses of either gender. The participant responses were analysed as a collective group. An exploratory study was carried out by the researcher for a period of 14 weeks (one semester) to investigate if the ARS-keepad technology could be used as a diagnostic tool for measuring vocabulary recognition tasks and also to study if it could assist instructors to increase vocabulary production in L2 learners, through structuring academic activities based on responses to recognition tasks. The researcher met the groups (involved in the study) twice a week and employed a seminar mode of instructional teaching. Expository and argumentative genres of writing were the main genres introduced to the students and tasks involved writing academic essays using citations in the Harvard Referencing Conventions. Students were also required to write research essays of about 2000 words, in the argumentative genre using a minimum list of eight references comprising journals and relevant literature, both print and electronic. Reading activities entailed identifying main ideas from texts, selecting expert views to substantiate student opinions and also developing the standard vocabulary required for academic writing at a tertiary level of learning. Writing tasks often involved paraphrasing sections of texts to demonstrate understanding of ideas from journal articles and writing perceptions from a pre-tertiary student point of view on various issues that were globally challenging. In essence, the unit was designed to engender proficiency in the English language for academic purposes and professional capabilities. Students were required to comprehend and interpret a variety of academic texts which were often introduced to them and standard reading and vocabulary developmental activities encompassed the learning processes.

Discussion and Analysis

ARS-keepad technology was used as a pedagogical tool in the classroom with the aim of increasing students' attentiveness and participation and to increase recognition of key vocabulary. Students were introduced to the ARS-keepad technology in an initial trial session, where the equipment was set up and students given instructions on how to use the response sets. In this session, students were given trial questions to respond to. No data was collected from the trials. However, observations were made regarding their enthusiasm and interest in the technology. One of the challenges in using this technology was the time required in setting up of the equipment. It took approximately 15 minutes to set up the equipment. In subsequent sessions, when the meanings of words were tested for recognition/ recall, the equipment was set up ahead of class commencement so that classes could proceed without any delays. The following instructions were provided to the students on a MS PowerPoint slide prior to task allocation.

- In this session you will be asked to look at words from readings given to you during the semester on several occasions and asked to select the answer you think best describes the meaning of the word.
- Please look at the word shown on the slide and select your answer from a choice of four multiple choice answers.

Figure 2 shows a sample slide on the query posed to study participants prior to their selection of responses.

Figure 2. *Sample vocabulary recognition /recall slide*

Students were observed to be enthusiastic and interactive during the learning tasks that employed ARS-keepad technology and also seen to be more attentive and participative in their discussions with peers. They appreciated the instant display of answers on the slide once they had selected their answers and presentation of the responses of the class as a whole to the vocabulary recognition questions, as indicated in the open-ended statements provided by them. They also favoured the ability to discuss the correct answers immediately after making their choice, as expressed in their comments. It was found to create a mutual awareness of the group as a whole through the presentation of questions and the distribution of responses displayed.

The use of turning point integrated PowerPoint slides in the classroom to introduce the words that learners had encountered in their reading texts allowed for self-evaluation of students' vocabulary knowledge against a standard after the learning had been completed. In addition, it facilitated self-monitoring of their vocabulary proficiency during the learning activity through the instant visual feedback on the screen to the multiple choice questions. Students needed to deliberate on the choices provided to them in order to guess the correct response. The immediate responses were used to promptly obtain understanding into the levels of vocabulary proficiency of the students and to create learning tasks to further enhance their vocabulary development. Students were observed to be motivated and participative during these activities and this is validated in their responses when asked about the method of learning. A quantitative analysis was also carried out in the study to assess participants' satisfaction and attitude to the use of technology in the classroom through displaying the statements using ARS-keepad technology using the Likert scale of analysis. The participants were asked to respond to each statement on a scale ranging between strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD). Figure 3 illustrates a sample slide to elicit responses from students on the comparative use of ARS-keepad technology in the classroom as opposed to traditional approaches.

Figure 3. Query on the use of ARS-keepad technology**Table 1:** Summary of student responses to statements

Statement posed to participants	SA	A	D	SD
This type of approach is more useful than traditional methods	100%	0%	0%	0%
It was useful to compare my responses with others	83%	12%	5%	0%
ARS-Keepad helps me to learn better	78%	11%	7%	4%
ARS-Keepad should be used more in the classroom	81%	9%	8%	2%
ARS-Keepad has not been a barrier to my learning	76%	10%	9%	5%

Table 1 provides a quantitative analysis of students' responses to ARS-keepad technology use in L2 vocabulary learning. Results from the students' responses conducted at the end of the study showed that students appreciated the increased interaction during the classroom learning activities achieved through the use of ARS-keepad technology and indicated that their level of understanding had improved considerably.

Most students perceived the technology as easy to use and reported that it was not a barrier to their learning (76%); the teaching approaches used with ARS-keepad technology was more useful than traditional teaching methods (100%); it helped them learn better (78%); that it should be used more in the classroom (81%); and that it was useful to compare their responses with that of others in the classroom (83%).

All participants agreed that they enjoyed their vocabulary learning experiences through the use of ARS-keepad technology (100%). The responses to other statements indicated that the participants had perceived the use of ARS-keepad in technology in the classroom positively with most participants recording high satisfaction rates.

The following responses were gained through the open-ended sections of the questionnaire administered to participants:

When asked whether the learning gained through using keepad technology was durable and if the students would remember the information later, students stated that:

“It is definitely valuable and durable to me, the experience is so rare and I am able to remember it”.

When asked if students discussed any of the questions posed to them later with their friends or classmates and what the focus of discussions was, they responded that:

“When one of my friends or classmates gave a wrong response, we will discuss the reason why the answer is wrong and explain the correct answer to them. This makes us learn from our mistakes”.

The majority agreed or strongly agreed that they experienced deeper learning as a consequence of the discussion that followed the questions.

Others commented that:

“Sometimes when the vocabulary is related to the terms in our engineering field we discuss about (sic) it.

This is an affirmation of students advancing learning strategies following the use of technology.

When responses were elicited about the value of keepad technology in the classroom, students commented that:

“Using Keepad in the classroom can make the learning process enjoyable and fruitful”.

When asked whether keepad had served as a diagnostic tool, they responded in a positive manner:

“Definitely, yes, because it allows a quick revision and focuses on the important parts of the subject” referring to vocabulary learning and development.

When asked whether they enjoyed using keepad as a diagnostic tool, that is, the lecturer used it to plan tutorials etc. they commented that:

“Definitely, yes, because it is an easier way to learn and to enjoy learning”.

Table 2 shows the key concepts and dimensions explored in the study. Essentially, students had valued the use of technology in their L2 vocabulary learning and had perceived it as an augmentation to instructor engagement. Their responses indicate that the use of technology in the L2 language classroom assists in cognitive processing of information. They had clearly enjoyed the interactive environment created with the use of technology. The students also affirmed that using ARS-keepad technology in the classroom had motivated them greatly and improved their competence and confidence in learning. Furthermore, they acknowledged that ARS-keepad technology use in the classroom had not posed any barriers in their learning and that using multiple choice questions had had the greatest impact on their vocabulary learning as the results were displayed instantaneously on the monitor and this had served as an impetus for them to use analysis to select more accurate answers. One of the desirable features of keepad technology that appealed to the students was the user friendly interface and the graphical statistical analysis which motivated students to be attentive. This is validated in their responses. All the students agreed that using ARS-keepad technology in the classroom had helped them to be more competent and help them gain confidence in their own abilities with regard to vocabulary proficiency.

Table 2. *Key concepts and dimensions explored in the study*

Aspects	Concepts
Value	Do students value the use of ARS?
Perception of learning	What are students' perceptions of ARS on their learning?
Cognitive Processing	Are the dual coding channels being used to process information?
Learning Strategies	Which behaviours are effective after using ARS?
Interaction	What occurs as social learning?
Attitudes	Are students supportive of this technology?

Conclusion

From the aforementioned analysis and discussions, it is compelling to assume that introducing new technologies alongside standard and valid instructional approaches assist vocabulary learning and development in students in the L2 classroom. The applications of technology which encourages, or requires students to interact on a regular basis throughout the class times effectively engender a difference in the teaching strategy. These findings have implications for both instructors and learners in L2 language acquisition and more importantly for L2 vocabulary learning and teaching, as the analysis from the study show that there is an increased awareness towards L2 vocabulary recognition tasks when learning tasks are integrated with ARS-keepad technology. It appears that the use of technology spurs awareness and interest in L2 learners regarding vocabulary learning tasks. The instant response collection and the ability of ARS-keepad via turning point and MS PowerPoint graphical slides to produce images, allowed for shared mental pictures among the students, and contributed to student engagement. It was discerned that the use of ARS-keepad stimulated discussions of the vocabulary choice answers displayed on the slides which further encouraged the recognition of vocabulary. It also helped establish an interactive teaching/learning environment in the classroom which was enjoyable as well as educative.

The responses gathered from the study participants were used to promptly obtain understanding into the levels of vocabulary proficiency of the students. Therefore, confirming that these procedures could be used for formative assessments of vocabulary. Another advantage of using the ARS-keepad technology was the anonymity it accorded the learners to provide their responses. It also allowed for a much interactive engagement of learners in the classroom, especially in situations where the students were from a more reserved cultural background. One of the most valuable benefits for the students in using ARS-keepad technology is an increase in interactivity and class participation. Additionally, by eliciting response questions intermittently in a class session, instructors are accustomed to the level of student understanding. It also provides a self-evaluative feedback to the students regarding their learning.

To conclude, the use of ARS-keepad technology allowed for a more integrative and participative approach and helped in the development of appropriate learning tasks for vocabulary learning and confirm that ARS-keepad is an effective technology to be used in the L2 classroom for vocabulary development.

Limitations and Recommendations

The study acknowledges the limitation in the relatively small number of participants, as it had been carried out only in two groups comprising a total of forty students. It is recommended that further studies using multiple groups and varied levels of ARS-keepad approaches be carried out in future in order to validate the function of new technologies in L2 classroom environments.

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