

Mobile App in Enhancing Vocabulary of Busay Jhs

Shiela Mae L. Arriola

Master of Arts in Education - English Teaching, Cebu Technological University, Cebu City, Cebu, Philippines

Email of Corresponding Author: mhae.limoran@gmail.com

Publication history:

Received: August 5, 2026

Revised: August 31, 2026

Accepted: September 3, 2026

Published: September 4, 2026

International Journal of Sustainable and Integrated Studies, Vol. 1, No. 2, pp. 64–72, September 2026.

Abstract

This study evaluated the effectiveness of a mobile application in enhancing the vocabulary performance of Grade 8 students at Busay National High School, particularly in determining word meanings through synonyms, antonyms, examples, and inference. It was anchored in the Cognitive Theory of Multimedia Learning and Mobile-Assisted Language Learning. A quasi-experimental one-group pre-test and post-test design was employed with 43 purposively selected students, comprising 22 males and 21 females. Data were collected using an adapted and pilot-tested vocabulary assessment, Quizizz as the instructional and assessment application, and an adapted survey questionnaire administered through Google Forms. The mean, standard deviation, dependent-samples t-test, and frequency distribution were used for data analysis. Results showed that the students' overall mean score increased from 19.837 in the pre-test to 31.302 in the post-test. The paired-samples t-test yielded a t-value of 33.56660868 and a two-tailed probability value of 5.77627E-32, indicating a statistically significant improvement after the intervention. Students also reported highly favorable experiences with the application, reflected in an overall weighted mean of 4.65, particularly in vocabulary development, confidence, participation, engagement, and motivation. The study concluded that appropriately facilitated mobile applications and multimedia-based activities can effectively supplement conventional vocabulary instruction. It recommends integrating suitable mobile applications into vocabulary lessons, strengthening teachers' competence in technology-supported instruction, using enriched vocabulary exercises, and establishing classroom rules to minimize distractions. The study supports SDG 4—Quality Education by promoting accessible, engaging, and technology-assisted literacy development. It contributes to educational, digital, and institutional sustainability by encouraging the purposeful use of available technologies and reusable instructional resources to support continuing language development.

Keywords: Cognitive Theory of Multimedia Learning; Context Clues; Mobile Application; Mobile-Assisted Language Learning; Quizizz; Vocabulary Development

1. Introduction

Vocabulary is fundamental to language learning, reading comprehension, written communication, and academic achievement. However, Filipino learners continue to experience difficulties in reading and vocabulary, as reflected in the Philippines' low performance in the Program for International Student Assessment. In response, educational policies and programs have promoted literacy development and technology-supported instruction. This study examines the use of a mobile application to enhance Grade 8 students' vocabulary, particularly their ability to determine word meanings through synonyms, antonyms, examples, and inference. It is grounded in the Cognitive Theory of Multimedia Learning and Mobile-Assisted Language Learning and responds to the need for accessible, engaging, and context-responsive vocabulary instruction at Busay National High School.

Vocabulary is an essential component of language proficiency because learners cannot communicate ideas clearly or understand texts without adequate knowledge of words. Vocabulary knowledge is strongly associated with

reading comprehension, making it necessary for literacy development and further academic learning. According to Principles for Teaching Vocabulary (2021), there is a strong correlation between vocabulary knowledge and reading comprehension. The Philippines ranked last in reading comprehension among the 79 countries that participated in the Program for International Student Assessment. The Department of Education consequently supports the Every Kid a Reader Program (DO 14, S. 2018), which aims to develop Filipino learners who can read and write at their appropriate grade levels. Literacy is also necessary for acquiring the knowledge and skills required to achieve sustainable development, peace, employment, and financial stability. Since readers cannot understand texts without knowing the meanings of most words, vocabulary instruction is central to strengthening comprehension and broader literacy outcomes. Mobile learning offers a possible response to these needs. It integrates modern education, computer networks, mobile communication, and multimedia technologies while providing portability and accessibility beyond the limitations of conventional distance learning. Mobile applications have become popular resources for vocabulary acquisition because they allow learners to access instructional content flexibly. However, the implementation of mobile learning remains developing, and its conceptual and instructional dimensions require further investigation (Kukulska-Hulme, 2002). The use of communication devices in classrooms may improve student learning and instructional practices. The DepEd Computerization Program (DCP) (DO 78, S. 2010) supports this direction by providing public schools with technologies intended to strengthen teaching and learning and address the demands of the 21st century. Accordingly, the present study investigates whether a mobile application can enhance the vocabulary performance of Junior High School students.

Vocabulary contributes to reading, writing, speaking, and listening because meaningful communication depends on understanding and using words appropriately. Vocabulary is a significant predictor of reading comprehension Baumann, Kame'enui, & Ash (2003) and student performance Stahl & Fairbanks (1986). Learners with broader vocabularies can understand more complex texts and produce more sophisticated written communication. Vocabulary is not an isolated skill but part of what Thorndike (1917) termed “a cooperation of many forces”. Effective vocabulary instruction therefore integrates structural, contextual, and morphemic analysis Baumann et al. (2003); Brusnighan & Folk (2012), oral language channels (Beck & McKeown (2007), text-based discussion and interaction (Lennox, 2013), and the development of word appreciation and consciousness (Graves & Watts-Taffe, 2008). Context clues are textual information that helps readers infer the meanings of unfamiliar or unusual words (Wongwiwattana, 2021). They may appear within the sentence containing the unfamiliar term or in surrounding sentences. Because much vocabulary is acquired through reading, learners must be able to recognize and apply contextual information without immediately consulting a dictionary (Wongwiwattana and Watanapokakul, 2021). The commonly used context clues examined in this study are synonyms, antonyms, examples, and inference (Wongwiwattana and Watanapokakul, 2021). Traditional classroom instruction once relied predominantly on textbooks, chalkboards, and teacher-directed delivery Beale (2007) and Klopfer (2008) as cited by Gholami and Azarmi (2012). Mobile applications extend instruction beyond these limitations. A mobile app's accessibility, usability, and adaptability can increase motivation and support continuous learning Zou and Li (2015), particularly when learners have insufficient classroom time to practice language skills (qtd. Ma and Yodkamlue, 2019). Studies comparing digital vocabulary tools with paper flashcards (Basoglu & Akdemir; Azabdaftari & Mozaheb; Nikoopour & Kazemi) as cited by Harger (2020) suggest that vocabulary applications may improve learning more effectively than conventional flashcards (Harger, 2020). Multimedia resources can provide videos, sounds, pictures, animation, interactive tasks, and flexible access that are unavailable in many conventional materials. Research conducted by Al-Seghayer (2001) has examined how these features support vocabulary learning. The development of mobile and wireless computing has transformed knowledge delivery from distance learning to electronic learning and, eventually, mobile learning. Pęcherzewska and Knot (2007) identified mobile devices as frequently used portable learning tools, while Tayebnik and Puteh (2012) emphasized their convenience and availability for educational purposes. Mobile technologies may support instruction Roschelle (2002), strengthen place-based learning (Squire et. al. (2007), and enhance learning (Squire and Dikkers, 2012). In language education, they can provide access to authentic materials, communicative practice, and meaningful task completion Chinnery (2006). Nevertheless, mobile technologies are generally regarded as supplementary resources rather than complete replacements for established teaching tools (Kukulska-Hulme, 2002; Waycott et. al, 2005).

Locally, the study addresses the vocabulary needs of Grade 8 learners at Busay National High School in Cebu City. The school has instructional facilities, including speech and computer laboratories and portable tablets, that can support technology-assisted learning. Despite the availability of such resources, learners require interventions that can improve vocabulary performance through engaging and accessible activities. Nationally, the study responds to declining reading comprehension and supports the literacy objectives of the Every Kid a Reader Program (DO 14, S. 2018). It is also aligned with the DepEd Computerization Program (DCP) (DO 78, S. 2010), which promotes the use of appropriate technologies in public schools. Globally, education has been affected by technological developments that allow faster communication and wider access to information. Teachers are expected to prepare learners with the knowledge and skills required for global competence Higgins (2008). Such preparation requires changes in instructional tools and practices, although technologies must be integrated

meaningfully into existing curricula rather than treated as isolated innovations Jackson (2004). Global education increasingly emphasizes independent learning, changing teacher–student relationships, and the role of information and communications technology (Adams & Carfagna, 2006). Flexible mobile resources can engage and motivate learners who require learning opportunities that accommodate competing demands Boyle (2003), as cited by Ally (105). In collaborative settings, handheld technologies can help learners recognize gaps in their knowledge and improve task understanding and performance Soloway and Norris (2005) (Using handheld computers in the classroom: Concrete visions). The 21st-century learner must not only possess information but also know how to locate, evaluate, and apply it in solving problems Higgins (2008), qtd. in Adams and Carfagna (2006). Mobile learning therefore represents an increasingly relevant approach to language and vocabulary education.

The study is anchored in the Cognitive Theory of Multimedia Learning and Mobile-Assisted Language Learning. The Cognitive Theory of Multimedia Learning is based on the multimedia principle, which proposes that learners understand information more deeply when words and pictures are meaningfully combined rather than when words are presented alone (Mayer, 2009). The theory assumes that auditory and visual information are processed through separate channels, that each channel has a limited capacity, and that learning requires the active selection, organization, and integration of information with prior knowledge. In research from L. (2020) stated that Mayer (2009) provides experimental support for presenting multimedia content in ways that do not overload working memory. Effective strategies include illustrating words with pictures, presenting related words and images near each other, and displaying corresponding information simultaneously. Mobile applications can operationalize these principles through combinations of text, sound, pictures, video, animation, and interactive activities. Their effectiveness depends not merely on the medium but on the instructional strategy used to organize and present content. As mentioned by Rezaei et al. (2014), mobile applications can support learning by providing varied activities for presenting and practicing content. Mobile-Assisted Language Learning refers to language learning facilitated by portable devices. According to Kukulska-Hulme and Shield (2002) MALL differs from computer-assisted language learning because personal and portable devices permit continuity, spontaneity, and communication across different learning contexts. Evidence indicates that MALL can support vocabulary learning Ogata et al. (2010), as cited by Rahimi and Miri (2014), student collaboration (Dias, 2002), communicative competence and motivation (Cooney and Keogh, 2007), and peer-assisted learning (Lan et. al. 2015). Mobile phones have also been associated with language learning generally (e.g., Rosell-Aguilar, 2007; Fallahkhair et. al. 2007), language-skill development (e.g., Chen and Chang, 2011; Chang and Hsu, 2011), positive attitudes and motivation (e.g., Huang et al., 2012), and communication, collaboration, and shared knowledge construction (Joseph and Uther, 2009). Although MALL research has frequently concentrated on teacher-led activities, learners' independent use of language applications has received less attention (Steel, 2012). Such applications are used because of their accessibility, convenience, and ease (Steel, 2012). They allow learners to review vocabulary without strict time or location restrictions and to work at a pace appropriate to their proficiency and retention. One early mobile language-learning initiative was the Stanford University learning laboratory's Spanish program in 2001 Brown as cited in Valarmathi (2011). Mobile learning can make waiting time productive, support repetition, and allow learners to apply knowledge immediately. Content, availability, and accessibility influence the use of mobile phones for vocabulary instruction Makoe and Shandu (2018), while learning beyond classroom boundaries is a major advantage of mobile phones and applications Basal et al. (2016). Conceptually, the study assumes that multimedia-based mobile activities can strengthen learners' understanding of vocabulary through contextual clues. The intervention therefore combines multimedia principles, mobile accessibility, and enriched exercises involving synonyms, antonyms, examples, and inference.

Although mobile technologies have produced generally positive learning outcomes, questions remain concerning their sustained effectiveness and whether improved performance results from lasting instructional value or temporary enthusiasm for a new device. Mobile learning is still in an evolving stage, and further investigation is necessary to clarify its pedagogical value (Kukulska-Hulme, 2008). Research has also frequently underestimated the vocabulary resources of English and the role of mobile applications in learners' independent language development. Existing MALL studies have focused largely on teacher-directed mobile learning, leaving students' experiences and application use comparatively underexamined (Steel, 2012). Traditional vocabulary instruction may restrict opportunities for creative practice, repeated exposure, personalized pacing, and learning beyond classroom time. The present study addresses these limitations by evaluating a mobile application in an actual Junior High School setting. It specifically investigates students' performance before and after the intervention, the significance of any performance difference, and their experiences while using the application. The study is therefore justified by the need for a context-responsive intervention that can strengthen vocabulary through synonyms, antonyms, examples, and inference. Its findings are intended to provide the basis for enriched vocabulary exercises appropriate to Grade 8 learners at Busay National High School.

The study is directly aligned with SDG 4 – Quality Education, which promotes inclusive and equitable education and lifelong learning opportunities. Sustainable Development Goal 4| Department of Economic and Social Affairs (SDG 4) (2019) emphasized that all learners should have access to high-quality and inclusive education. By supporting vocabulary development, reading comprehension, and access to technology-assisted instruction, the

study contributes to literacy and more effective participation in learning. The use of a mobile application may provide learners with additional opportunities to practice vocabulary inside and outside the classroom, thereby supporting flexible and continuing learning. The study also supports the educational use of digital resources envisioned in national technology initiatives. Its emphasis on accessible multimedia instruction connects quality education with responsible technological integration rather than treating mobile devices solely as communication or entertainment tools.

The study contributes primarily to educational sustainability by developing an instructional approach that may strengthen vocabulary, reading comprehension, learner participation, and continued language development. Enriched vocabulary exercises can provide teachers with reusable learning materials and offer students repeated opportunities to practice essential literacy competencies. It contributes to technological and digital sustainability by examining how available mobile devices and school technologies can be used purposefully for instruction. The study encourages the integration of applications into existing teaching practices while recognizing that technology should supplement, rather than automatically replace, established instructional methods. The research also has relevance to socio-economic sustainability because literacy and language proficiency influence learners' ability to access information, continue their education, and prepare for future employment. Improving vocabulary may therefore support both present academic performance and longer-term participation in social and economic life. At the institutional level, the study can guide school administrators and teachers in selecting appropriate technology-supported vocabulary strategies. It may also provide future researchers with a basis for examining mobile learning, multimedia instruction, and language development in other educational contexts.

2. Material and methods

2.1 Research Design

The study used a quasi-experimental one-group pre-test and post-test design. The participants were not randomly assigned because an existing class was selected for the intervention. Their vocabulary performance was measured before and after using the mobile application, and the resulting scores were compared to determine whether a significant difference occurred. The pre-test was administered through a paper-and-pencil assessment. After the vocabulary lesson and mobile application intervention, the same group completed a post-test using the application. A survey questionnaire administered through Google Forms was also used to examine the students' experiences with mobile-assisted vocabulary learning.

2.2 Locale of the Study

The study was conducted at Busay National High School, a public secondary school located along Trans Central Road in Busay, Cebu City, Central Visayas. The school, formerly known as Busay Rural High School, serves Junior and Senior High School learners under the K to 12 Program. Busay National High School belongs to North District 3 of the Division of Cebu City. At the time of the study, it had 354 Junior High School students, 135 Senior High School students, 19 teachers, and one school principal. The school had facilities that could support technology-assisted learning, including a library, a Technology and Livelihood Education laboratory, a speech laboratory, Junior and Senior High School computer laboratories, and portable tablets.

2.3 Respondents of the Study

The respondents were Grade 8 students enrolled at Busay National High School during the school year 2022–2023. The Grade 8 level consisted of two sections, Faith and Patience. Grade 8 Patience was selected because its members matched the respondent profile required by the study and could provide the necessary data. A total of 43 students participated, comprising 22 males and 21 females. All learners in the selected section were included in the study.

2.4 Sample and Sampling Procedure

Purposive sampling was used to select the respondents. This procedure involves choosing participants for a specific research purpose. Grade 8 Patience was selected because the entire class met the characteristics required for the investigation and was considered appropriate for measuring vocabulary performance before and after the intervention. The study therefore used the whole population of the selected section rather than randomly choosing individual students from the Grade 8 level.

2.5 Research Instrument

The study used an adapted vocabulary assessment that underwent pilot testing with another Grade 8 section from the same school. The pilot test was conducted to determine whether the items were understandable to the students and to assess the instrument's face validity. The assessment measured vocabulary performance through context clues involving synonyms, antonyms, examples, and inference. It was administered as a paper-and-pencil pre-test before the intervention and as a post-test after the use of the mobile application. Quizizz was used as the instructional and assessment application. It allowed the researcher to present quizzes as live, timed activities or assigned exercises with deadlines. Students could review their responses after completing the assessment, while

the application compiled their results into a spreadsheet for performance analysis. An adapted and modified survey questionnaire was also used to determine the students' experiences with the mobile application. The questionnaire was administered through Google Forms, and the responses were subjected to statistical analysis as bases for the conclusions and recommendations.

2.6 Data Gathering Procedure

Before collecting the data, the researcher obtained written permission from the principal of Busay National High School. Consent and assent forms were also distributed to the parents and students involved in the study. After approval was secured, the researcher explained the study's purpose to the participants. The adapted assessment was first pilot-tested in another Grade 8 section. The paper-and-pencil pre-test was then administered to the respondents to determine their initial vocabulary performance. After collecting the pre-test results, the researcher conducted the lesson and integrated the mobile application into vocabulary instruction. The post-test was subsequently administered, and the students' scores before and after the intervention were compiled for comparison. The respondents then completed the adapted and modified survey questionnaire through Google Forms to describe their experiences while using the mobile application. After data collection, the results were computed, analyzed, and interpreted. The findings were used as the basis for developing enriched vocabulary exercises.

2.7 Data Analysis Techniques

The study used the mean, standard deviation, dependent-samples t-test, and frequency distribution to analyze the collected data. The mean was used to determine the students' vocabulary performance before and after the intervention. The standard deviation measured the dispersion of scores in the four context-clue areas: synonyms, antonyms, examples, and inference. The dependent-samples t-test was used to determine whether a significant difference existed between the students' pre-test and post-test performance. The null hypothesis was tested at the 0.05 level of significance. Frequency distribution was used to summarize the students' responses regarding their experiences with the mobile application. Their responses were measured using a five-point Likert scale. The assessment scores were also described using the total number of items, mean, standard deviation, highest score, and lowest score.

2.8 Ethical Considerations

The researcher secured permission from the school principal before conducting the study. Parents were provided with informed consent forms, while the participating students received informed assent forms. The purpose and procedures of the study were explained to the respondents before the assessments and intervention were administered.

3. Results and Discussion

3.1 Vocabulary Performance Using Context Clues

3.1.1 Performance Before Using the Mobile Application

Before the intervention, the students obtained mean scores of 5.02 for synonyms, 5.02 for antonyms, 4.00 for examples, and 5.79 for inference out of 10 items in each category. The highest scores were 7 for synonyms and antonyms, 5 for examples, and 8 for inference, while the lowest score in every category was 3. These results showed that the students' initial vocabulary performance was relatively low and indicated a need for intervention. The findings suggest that the students experienced difficulty learning and applying English vocabulary through traditional paper-based activities. Conventional language-teaching methods may be less effective for the current generation of learners, as mobile applications increasingly replace classroom flashcards (Harger, 2020). Appropriate technology integration and innovative learning approaches are therefore increasingly important in education (Demir and Akpınar, 2018).

3.1.2 Performance After Using the Mobile Application

After the intervention, the students' mean scores increased to 8.21 for synonyms, 7.37 for antonyms, 8.21 for examples, and 7.51 for inference. The highest scores were 9 for synonyms, examples, and inference and 7 for antonyms, while the lowest scores were 7 for synonyms and examples, 3 for antonyms, and 6 for inference. The higher post-test scores demonstrated improved vocabulary performance across all four context-clue competencies. The improvement indicates that the mobile application was effective in teaching context clues. Suwantarathip and Orawiatnakul (2015) similarly found that students who received vocabulary instruction through SMS performed better than those who completed paper-based classroom activities. Saran and Seferoglu (2010) also reported better follow-up scores among students who received vocabulary lessons through SMS and MMS containing text, pictures, and sounds. Basoglu and Akdemir (2010) found that learners who studied vocabulary through a mobile application performed significantly better than those who used flashcards. Although Stockwell (2010) observed no statistically significant difference between learning through mobile devices and personal computers, most students preferred mobile phones. Mobile applications can make vocabulary activities more engaging, attract learners' attention, and lower affective barriers, allowing students to focus more effectively on instructional

content. They may also function as motivational tools in various educational activities (qtd. by Jamal et al., 2021). However, teachers must guide students in using such applications to ensure that learning remains successful and meaningful, according to Klimova (2019).

3.1.3 Significant Difference Between Pre-Test and Post-Test Performance

The overall mean score increased from 19.837 in the pre-test to 31.302 in the post-test. The paired-samples t-test yielded a t-value of 33.56660868 with 42 degrees of freedom and a two-tailed probability value of 5.77627E-32. Since the probability value was below the 0.05 significance level, the null hypothesis was rejected. The result confirmed a statistically significant difference between the students' performance before and after using the mobile application. The substantial increase in vocabulary scores indicates that mobile-assisted learning was more effective than the traditional approach used before the intervention. This coincides with the study from Oberer and Erkollar (2013) and Hwang and Chang (2011) as cited by Demir and Akpınar (2018). According to Hwang and Chang (2011), mobile learning increases student engagement and improves academic achievement. The successful integration of the application therefore supported vocabulary development through synonyms, antonyms, examples, and inference.

3.2 Students' Experiences Using the Mobile Application

The students reported highly favorable experiences with mobile-assisted vocabulary learning, as shown by an overall weighted mean of 4.65. Their responses indicated strong agreement that the application supported vocabulary development, practice, confidence, class participation, motivation, and engagement. The results further showed that the application contributed to improved performance, a more engaging learning environment, and increased motivation. The favorable responses indicate that mobile-assisted learning was perceived as useful, personalized, and learner-centered. Kukulska-Hulme (2002) and Shield, as reported by Metierre (2021), indicated that students favor using mobile devices for vocabulary development and that mobile-assisted learning produces beneficial outcomes. Godwin-Jones (2011), Rezaei et al. (2014), Nisbet & Austin (2013) as cited by Harger (2020) also provided evidence supporting mobile applications for vocabulary learning. Smartphones are particularly appropriate for personalized and informal learning (Harger, 2020), while their interactive features can increase interest in vocabulary acquisition. Mobile phones have become an important means through which contemporary learners access knowledge and information, according to Wisnuwardana (2019) as cited by Metierre (2021). Educators must therefore integrate mobile-based informal learning into classroom language instruction. Students' perceptions of the benefits of mobile applications may also encourage their installation and continued use Stefanska and Wanat (2017) as cited by Metierre (2021).

4. Conclusion & Recommendations

The study concluded that integrating Mobile-Assisted Language Learning and the Cognitive Theory of Multimedia Learning into vocabulary instruction was effective in improving the performance of Grade 8 students at Busay National High School. The students obtained higher scores after using the mobile application, demonstrating improved ability to determine the meanings of unfamiliar words through synonyms, antonyms, examples, and inference. The statistically significant difference between the pre-test and post-test results confirmed that the mobile application was more effective than the traditional paper-and-pencil activities used before the intervention. The students' favorable experiences further showed that mobile-assisted instruction made vocabulary learning more engaging, increased their motivation and confidence, encouraged active classroom participation, and provided additional opportunities to practice and review vocabulary. These findings establish that appropriately facilitated mobile applications and multimedia-based activities can serve as effective supplementary tools for developing vocabulary knowledge among Junior High School learners.

Teachers should integrate appropriate mobile applications and other instructional technologies into vocabulary lessons to provide learners with interactive, engaging, and accessible opportunities for language practice. Since students are familiar with portable digital devices, teachers should guide them in using these technologies not only for communication and entertainment but also for meaningful academic learning. Language teachers should become knowledgeable about the functions and instructional uses of available vocabulary applications, carefully select applications that correspond with lesson objectives, and maintain a positive attitude toward technology-supported instruction. The enriched vocabulary exercises developed from the findings may be used to provide further practice in identifying meanings through synonyms, antonyms, examples, and inference. School administrators should support teachers in improving technology-based teaching practices, while clear classroom rules should be established before mobile devices are used to reduce distractions and ensure that the applications promote active and purposeful learning. Future researchers may also use the study as a basis for further investigations and for improving technology-assisted vocabulary instruction in other educational settings.

5. Compliance with ethical standards

The study complied with institutional ethical requirements by securing approval from the school principal and obtaining informed consent from parents and informed assent from participating students. Participation was voluntary, and respondents' information was treated confidentially and used solely for research purposes. The researcher assumes responsibility for the accuracy, originality, and proper attribution of the work, acknowledges all individuals who contributed to the study, observes applicable copyright requirements, and declares no conflict of interest.

REFERENCES

- Adams, J. M., & Carfagna, A. (2006). *Coming of age in a globalized world: The next generation*. Kumarian Press.
- Al-Seghayer, K. (2001). The effect of multimedia annotation modes on L2 vocabulary acquisition: A comparative study. *Language Learning & Technology*, 5(1), 202–232. <https://doi.org/10.64152/10125/25117>
- Basal, A., Yilmaz, S., Tanriverdi, A., & Sari, L. (2016). Effectiveness of mobile applications in vocabulary teaching. *Contemporary Educational Technology*, 7(1), 47–59. <https://doi.org/10.30935/cedtech/6162>
- Başoğlu, E. B., & Akdemir, Ö. (2010). A comparison of undergraduate students' English vocabulary learning: Using mobile phones and flash cards. *The Turkish Online Journal of Educational Technology*, 9(3), 1–7.
- Baumann, J. F., Edwards, E. C., Boland, E. M., Olejnik, S., & Kame'enui, E. J. (2003). Vocabulary tricks: Effects of instruction in morphology and context on fifth-grade students' ability to derive and infer word meanings. *American Educational Research Journal*, 40(2), 447–494. <https://doi.org/10.3102/00028312040002447>
- Baumann, J. F., Kame'enui, E. J., & Ash, G. E. (2003). Research on vocabulary instruction: Voltaire redux. In J. Flood, D. Lapp, J. R. Squire, & J. M. Jensen (Eds.), *Handbook of research on teaching the English language arts* (2nd ed., pp. 752–785). Lawrence Erlbaum Associates.
- Beale, R. (2007). Ubiquitous learning or learn how to learn and you'll never have to learn anything again? In I. Arnedillo-Sánchez, M. Sharples, & G. Vavoula (Eds.), *Beyond mobile learning workshop* (pp. 64–65). Trinity College Dublin Press.
- Beck, I. L., & McKeown, M. G. (2007). Increasing young low-income children's oral vocabulary repertoires through rich and focused instruction. *The Elementary School Journal*, 107(3), 251–271. <https://doi.org/10.1086/511706>
- Boyle, T. (1997). *Design for multimedia learning*. Prentice Hall.
- Boyle, T. (2003). Design principles for authoring dynamic, reusable learning objects. *Australasian Journal of Educational Technology*, 19(1), 46–58. <https://doi.org/10.14742/ajet.1690>
- Bradley, C., Haynes, R., Cook, J., Boyle, T., & Smith, C. (2009). Design and development of multimedia learning objects for mobile phones. In M. Ally (Ed.), *Mobile learning: Transforming the delivery of education and training* (pp. 157–182). Athabasca University Press. <https://doi.org/10.15215/aupress/9781897425435.01>
- Brusnighan, S. M., & Folk, J. R. (2012). Combining contextual and morphemic cues is beneficial during incidental vocabulary acquisition: Semantic transparency in novel compound word processing. *Reading Research Quarterly*, 47(2), 172–190. <https://doi.org/10.1002/RRQ.015>
- Chang, C.-K., & Hsu, C.-K. (2011). A mobile-assisted synchronously collaborative translation–annotation system for English as a foreign language reading comprehension. *Computer Assisted Language Learning*, 24(2), 155–180. <https://doi.org/10.1080/09588221.2010.536952>
- Chen, I.-J., & Chang, C.-C. (2011). Content presentation modes in mobile listening tasks: English proficiency as a moderator. *Computer Assisted Language Learning*, 24(5), 451–470. <https://doi.org/10.1080/09588221.2011.577749>
- Chinnery, G. M. (2006). Emerging technologies: Going to the MALL—Mobile assisted language learning. *Language Learning & Technology*, 10(1), 9–16. <https://doi.org/10.64152/10125/44040>
- Cooney, G., & Keogh, K. (2007). *Use of mobile phones for language learning and assessment for learning* [Conference paper]. mLearn 2007.
- David, L. (2020, March 5). *Cognitive theory of multimedia learning* (Mayer). Learning Theories. <https://learning-theories.com/cognitive-theory-of-multimedia-learning-mayer.html>
- Department of Education. (2010, June 10). *Guidelines on the implementation of the DepEd Computerization Program (DCP)* (DepEd Order No. 78, s. 2010). <https://www.deped.gov.ph/2010/06/10/do-78-s-2010-guidelines-on-the-implementation-of-the-deped-computerization-program-dcp/>
- Department of Education. (2018, March 26). *Policy guidelines on the administration of the revised Philippine Informal Reading Inventory* (DepEd Order No. 14, s. 2018). <https://www.deped.gov.ph/2018/03/26/do-14-s-2018-policy-guidelines-on-the-administration-of-the-revised-philippine-informal-reading-inventory/>

- Demir, K., & Akpınar, E. (2018). The effect of mobile learning applications on students' academic achievement and attitudes toward mobile learning. *Malaysian Online Journal of Educational Technology*, 6(2), 48–59. <https://doi.org/10.17220/mojet.2018.02.004>
- Dias, J. (2002). Cell phones in the classroom: Boon or bane? Part 1. *C@lling Japan*, 10(2), 16–21.
- Fallahkhair, S., Pemberton, L., & Griffiths, R. (2007). Development of a cross-platform ubiquitous language learning service via mobile phone and interactive television. *Journal of Computer Assisted Learning*, 23(4), 312–325. <https://doi.org/10.1111/j.1365-2729.2007.00236.x>
- Gholami, J., & Azarmi, G. (2012). An introduction to mobile assisted language learning. *International Journal of Management, IT and Engineering*, 2(8), 1–9.
- Global Partnership for Education. (2019, September 8). *Literacy is key to achieving the SDGs by 2030*. <https://www.globalpartnership.org/blog/literacy-key-achieving-sdgs-2030>
- Graves, M. F., & Watts-Taffe, S. M. (2008). For the love of words: Fostering word consciousness in young readers. *The Reading Teacher*, 62(3), 185–193. <https://doi.org/10.1598/RT.62.3.1>
- Harger, L. (2020). *The impact of the use of mobile computing on vocabulary learning in the language classroom* [Graduate research paper, University of Northern Iowa]. UNI ScholarWorks. <https://scholarworks.uni.edu/grp/1385>
- Higgins, M. R. (2008). *21st century learning skills: Global learning in an urban middle school* [Master's thesis, Wichita State University]. SOAR: Shocker Open Access Repository. <http://hdl.handle.net/10057/2048>
- Huang, Y.-M., Huang, Y.-M., Huang, S.-H., & Lin, Y.-T. (2012). A ubiquitous English vocabulary learning system: Evidence of active/passive attitudes versus usefulness/ease of use. *Computers & Education*, 58(1), 273–282. <https://doi.org/10.1016/j.compedu.2011.08.008>
- Hwang, G.-J., & Chang, H.-F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers & Education*, 56(4), 1023–1031. <https://doi.org/10.1016/j.compedu.2010.12.002>
- Jackson, A. (2004). Preparing urban youths to succeed in the interconnected world of the 21st century. *Phi Delta Kappan*, 86(3), 210–213.
- Jamal, M. F., Hashim, H., & Esa, I. (2021). The use of mobile apps as strategies in teaching vocabularies among English teachers. *International Journal of Academic Research in Progressive Education and Development*, 10(3), 265–274. <https://doi.org/10.6007/IJARPED/v10-i3/10833>
- Joseph, S., & Uther, M. (2009). Mobile devices for language learning: Multimedia approaches. *Research and Practice in Technology Enhanced Learning*, 4(1), 7–32. <https://doi.org/10.1142/S179320680900060X>
- Klimova, B. (2019). Impact of mobile learning on students' achievement results. *Education Sciences*, 9(2), Article 90. <https://doi.org/10.3390/educsci9020090>
- Klopfer, E. (2008). *Augmented learning: Research and design of mobile educational games*. MIT Press.
- Kukulska-Hulme, A. (2002). Cognitive, ergonomic, and affective aspects of PDA use for learning. In *Proceedings of the European Workshop on Mobile and Contextual Learning* (pp. 32–33). University of Birmingham.
- Kukulska-Hulme, A., & Shield, L. (2008). An overview of mobile assisted language learning: From content delivery to supported collaboration and interaction. *ReCALL*, 20(3), 271–289. <https://doi.org/10.1017/S0958344008000335>
- Lennox, S. (2013). Interactive read-alouds—An avenue for enhancing children's language for thinking and understanding: A review of recent research. *Early Childhood Education Journal*, 41(5), 381–389. <https://doi.org/10.1007/s10643-013-0578-5>
- Ma, X., & Yodkamlue, B. (2019). The effects of using a self-developed mobile app on vocabulary learning and retention among EFL learners. *PASAA*, 58, 166–205. <https://doi.org/10.58837/CHULA.PASAA.58.1.7>
- Makoe, M., & Shandu, T. (2018). Developing a mobile app for learning English vocabulary in an open distance learning context. *The International Review of Research in Open and Distributed Learning*, 19(4), 208–221. <https://doi.org/10.19173/irrodl.v19i4.3746>
- Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). Cambridge University Press. <https://doi.org/10.1017/CBO9780511811678>
- Metierre, J. J. D. (2021). Perceptions, attitudes and benefits of using smartphone applications toward the learners' vocabulary improvement. *EPRA International Journal of Research and Development*, 6(7), 665–667.
- OECD. (2019). *PISA 2018 assessment and analytical framework*. OECD Publishing. <https://doi.org/10.1787/b25efab8-en>
- Ogata, H., Yin, C., El-Bishouty, M. M., & Yano, Y. (2010). Computer supported ubiquitous learning environment for vocabulary learning. *International Journal of Learning Technology*, 5(1), 5–24. <https://doi.org/10.1504/IJLT.2010.031613>
- Pęcherzewska, A., & Knot, S. (2007). *Review of existing EU projects dedicated to dyslexia, gaming in education and m-learning* (WR08 report to the CallDysc project).
- Principles for teaching vocabulary*. (2021, March 15). Willy's ELT Corner. <https://willyrenandya.com/principles-for-teaching-vocabulary/>
- Rahimi, M., & Miri, S. S. (2014). The impact of mobile dictionary use on language learning. *Procedia—Social and Behavioral Sciences*, 98, 1469–1474. <https://doi.org/10.1016/j.sbspro.2014.03.567>

- Rezaei, A., Mai, N., & Pesaranghader, A. (2014). The effect of mobile applications on English vocabulary acquisition. *Jurnal Teknologi*, 68(2), 73–83. <https://doi.org/10.11113/jt.v68.2912>
- Roschelle, J., & Pea, R. (2002). A walk on the WILD side: How wireless handhelds may change computer-supported collaborative learning. *International Journal of Cognition and Technology*, 1(1), 145–168.
- Rosell-Aguilar, F. (2007). Top of the pods—In search of a podcasting “podagogy” for language learning. *Computer Assisted Language Learning*, 20(5), 471–492. <https://doi.org/10.1080/09588220701746047>
- Saran, M., & Seferoglu, G. (2010). Supporting foreign language vocabulary learning through multimedia messages via mobile phones. *Hacettepe University Journal of Education*, 38, 252–266.
- Soloway, E., & Norris, C. (2005). *Using handheld computers in the classroom: Concrete visions* [Keynote address]. Fourth World Conference on Mobile Learning.
- Squire, K., & Dikkers, S. (2012). Amplifications of learning: Use of mobile media devices among youth. *Convergence: The International Journal of Research into New Media Technologies*, 18(4), 445–464. <https://doi.org/10.1177/1354856511429646>
- Squire, K. D., Jan, M., Matthews, J., Wagler, M., Martin, J., DeVane, B., & Holden, C. (2007). Wherever you go, there you are: The design of local games for learning. In B. E. Shelton & D. A. Wiley (Eds.), *The design and use of simulation computer games in education* (pp. 265–296). Sense Publishers.
- Stahl, S. A., & Fairbanks, M. M. (1986). The effects of vocabulary instruction: A model-based meta-analysis. *Review of Educational Research*, 56(1), 72–110. <https://doi.org/10.3102/00346543056001072>
- Steel, C. H. (2012). Fitting learning into life: Language students’ perspectives on the benefits of using mobile apps. In M. Brown, M. Hartnett, & T. Stewart (Eds.), *Future challenges, sustainable futures: Proceedings of ASCILITE 2012* (pp. 875–880). <https://doi.org/10.14742/apubs.2012.1546>
- Stockwell, G. (2010). Using mobile phones for vocabulary activities: Examining the effect of the platform. *Language Learning & Technology*, 14(2), 95–110.
- Suwantharithip, O., & Orawiatnakul, W. (2015). Using mobile-assisted exercises to support students’ vocabulary skill development. *The Turkish Online Journal of Educational Technology*, 14(1), 163–171.
- Tayebinik, M., & Puteh, M. (2012). Mobile learning to support teaching English as a second language. *Journal of Education and Practice*, 3(7), 56–62.
- Thorndike, E. L. (1917). Reading as reasoning: A study of mistakes in paragraph reading. *Journal of Educational Psychology*, 8(6), 323–332. <https://doi.org/10.1037/h0075325>
- United Nations Department of Economic and Social Affairs. (2019). *Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*. <https://sdgs.un.org/goals/goal4>
- Valarmathi, K. E. (2011). Mobile assisted language learning. *Journal of Technology for ELT*, 1(2).
- Waycott, J., Jones, A., & Scanlon, E. (2005). PDAs as lifelong learning tools: An activity theory-based analysis. *Learning, Media and Technology*, 30(2), 107–130. <https://doi.org/10.1080/17439880500093513>
- Wongwiwattana, S., & Watanapokakul, S. (2021). Types of context clues and vocabulary meaning inference: Abilities and perceptions of English major undergraduate students. *rEFlections*, 28(3), 357–380. <https://doi.org/10.61508/refl.v28i3.258802>
- Zou, B., & Li, J. (2015). Exploring mobile apps for English language teaching and learning. In F. Helm, L. Bradley, M. Guarda, & S. Thoučny (Eds.), *Critical CALL—Proceedings of the 2015 EUROCALL Conference, Padova, Italy* (pp. 564–568). Research-publishing.net. <https://doi.org/10.14705/rpnet.2015.000394>