# An investigation of the effectiveness of English language apps for EFL vocabulary building

Anna Wing-bo Tso*
Hang Seng University of Hong Kong
annatso@hsu.edu.hk

**Abstract:** As new media and web technologies proliferate in the digital era, digital experiences play an increasingly significant role in modern life. In order to help students learn English vocabulary, educators and app designers have developed various English language learning apps which attract and engage students. As more and more university students rely on apps to study English, there is a need to evaluate the designs, contents, and effectiveness of the language apps for learning English as a foreign language (EFL). With a special focus on vocabulary building for EFL university students in Hong Kong, this study first looks into the chances and challenges in English vocabulary learning and teaching through interviews with teachers and a student survey at a university in Hong Kong. Then, it examines the contents and designs of some current English language learning apps commonly used by Hong Kong EFL students. Subsequently, the paper discusses the criteria for

---

*Anna Wing-bo Tso obtained her Ph.D. in Applied Linguistics from The University of Birmingham, U.K. She is an associate professor of English at the Hang Seng University of Hong Kong. Her research interests lie at the intersection of children's literature, gender studies, and English language education.

evaluating effective EFL language apps that help EFL students improve their vocabulary skills.

**Keywords:** English language apps, vocabulary building, behaviorist learning, situated learning, constructivist learning, collaborative learning, informal learning

## Chances and challenges: EFL vocabulary building in Asia

Core to all language skills, vocabulary building is the cornerstone for attaining language competence (Nation, 2011). In the language production process, "when we have a meaning or concept that we wish to express, we need to have a store of words from which we can select to express this meaning or concept" (Alqahtani, 2015, p. 22). Insufficient English vocabulary knowledge can lead to all sorts of difficulties in speaking, listening, reading and writing. This is doubly so when it comes to second and foreign language learning. Unfortunately, due to the open-ended nature of lexis, English vocabulary cannot be taught as systematically as English grammar. As Read (2004) points out, in English classes, "language teachers are often unsure about how best to incorporate vocabulary learning into their teaching." (p. 146). Hamzah, Kafipour and Abdullah (2009) confirm that in Asia, English vocabulary learning is to a large extent only a by-product of the integrative language approach. It is seldom taught as an individual subject area. Even when vocabulary learning and teaching is included in the formal curriculum, Wu (2009) reveals that in China, English teachers are still using such traditional vocabulary teaching methods as "repeating vocabulary, explaining the meaning of vocabulary in native language, letting students recite new words, and making students do plenty of vocabulary exercises" (p. 1).

At the university for which I am working in Hong Kong, there are English academic writing courses and English presentation courses tailor-made for all year-one students, but none of these enhancement courses are for vocabulary building. To get the full picture of EFL students' vocabulary building at university, in June 2019, I interviewed three language teachers who teach undergraduates majoring in language studies and English-Chinese translation at a tertiary institution in Hong Kong. According to the language teachers, most EFL students are weak in English vocabulary skills due to a lack of a rich English language environment as well as insufficient training in vocabulary learning strategies:

**Table 1.** EFL teachers' observations of undergraduates' vocabulary learning in Hong Kong.

| | |
|---|---|
| Feedback 1 | "I think the students' foundation has not been very solid since they were young. They don't have an effective and persistent habit to learn vocabulary. They don't invest a lot of time in it. Their focus is not on spending time to learn English." |
| Feedback 2 | "The students I'm teaching are from language studies and in fact their English level is not very high. The point is we don't have a rich English speaking environment. When they have learned a word, they don't have the opportunity to use it or speak it… we don't have that many exchange students… everyone hardly speaks English." |
| Feedback 3 | "No, I have not observed any vocabulary learning strategies employed by the students. In general, they do not have any systematic preparation, like I have never seen a student using a notebook to collect words." |

EFL students in Hong Kong are not unaware of their deficiency in English vocabulary training either. Having taught English language and literature to undergraduate students in Hong Kong for over ten years, I noticed that many of my students want to improve their English vocabulary, though they have not been provided with much formal training in vocabulary learning, not to mention any system preparation or vocabulary learning strategies. In October 2019, I administered a survey with 30 EFL year-one students in Hong Kong, asking them of their perceptions towards English vocabulary learning apps. It was found that all of them were aware of the general advantages of learning English through language apps. From the survey, 23 out of 30 of the student participants (i.e., 76.67%) were eager to try self-directed learning in improving their English vocabulary. In addition, five 17-year-old year-one students who participated in the survey joined the focus group interview and shared their views about learning English vocabulary through apps:

**Table 2.** Hong Kong EFL students' reactions about learning English vocabulary via apps.

| | |
|---|---|
| Student Comment 1 | "Using English language apps is a good way for me to look up the words whenever and wherever I want." |

| Student Comment 2 | "I would like to try English language apps because I think it can be more entertaining than the traditional way of learning English vocabulary." |
|---|---|
| Student Comment 3 | "Some English language apps look really attractive and interactive. I would love to try them." |
| Student Comment 4 | "It's easy to use the language apps in smart phones. It's easier than bringing along a dictionary everywhere." |
| Student Comment 5 | "It's a good idea to learn English via apps at home. It's just so convenient." |

Indeed, unlike other conventional classroom teaching materials, apps offer a combination of flexibility, accessibility, and interactivity (El-Hussein & Cronje, 2010; Liu et al., 2009). Findings of numerous studies have already shown that apps encourage learners' motivation and self-regulated learning (Tso & Lau, 2018), improving learners' academic performance (Tso & Lau, 2016) and learning attitude (Kramarski & Gutman, 2006).

A few student participants had also expressed concerns about not having deep learning when playing language apps, but the worries are largely unnecessary because in most cases, language apps would not be the only channel through which EFL students learn English. Often, besides using language apps to enhance their learning, EFL students also learn English through having formal English lessons in school, reading authentic English materials, watching English clips on *YouTube*, enjoying English audiobooks, communicating with others in social media, etc. Various metacognitive strategies such as planning, monitoring, and evaluation of learning (Schmitt, 1997) are employed as "blended learning – a mixed approach" takes place (Tso, 2019, p. 113). That said, the heart of the matter is: now that there are so many English learning apps, how do we know whether the English language apps used by EFL learners and teachers are the most effective ones for vocabulary building?

**Objectives of the paper**

While it is impossible to evaluate all the language apps in the market, this study attempts to discuss the formulaic designs and contents of some of the common apps and examine the quality of the learning experiences they bring to language apps users. The research questions of this study are:

(i) How do English language apps enhance learning and EFL vocabulary building?

(ii) How effective are English language learning apps commonly used by Hong Kong EFL learners?

To answer the two research questions, this paper gives an overview of two assessment grids commonly used to evaluate English language learning apps (See Table 1). The first grid aligns apps learning experiences with key learning theories, and the second grid with core vocabulary learning strategies. In the first part of the following discussion, I will look into how some typical language apps encourage the key learning methods in the first assessment grid of apps, namely (1) behaviourist learning; (2) situated learning; (3) constructivist learning; (4) collaborative learning theory; and (5) informal learning. Then in the second part of the discussion, I will introduce Deng and Trainin's (2015) four vocabulary learning strategies (VLS), namely dictionary use, phonological analysis, morphological analysis, and contextual analysis, all of which shall form the second apps assessment grid.

**Table 3.**   The proposed evaluation criteria of effective vocabulary learning apps

| Vocabulary Learning Theories / Education Theories | Dictionary Use | Phonological Analysis | Morphological Analysis | Contextual Analysis |
|---|---|---|---|---|
| 1. Behaviourist Learning | | | | |
| 2. Situated Learning | | | | |
| 3. Constructivist Learning | | | | |
| 4. Collaborative Learning | | | | |
| 5. Informal Learning | | | | |

By aligning the apps learning experiences with the key learning theories and Deng and Trainin's (2015) VLS, the effectiveness of three vocabulary apps commonly used by Hong Kong EFL students will be analyzed.

**Evaluating English language apps with learning theories**

*Behaviourist learning in English language Apps*

Language learning is no different from forming habits. It happens as learners learn to

respond to stimuli generated in the language environment. According to Ellis (2003), "[l]earning took place when learners had the opportunity to practise making the correct response to a given stimulus. Learners imitated models of correct language and received positive reinforcement if they were correct." (p. 31) In other words, behaviourist learning takes place when mobile apps provide drill, quizzes, instant model answers and feedback. In language learning apps, 'drill and feedback' is one of the most popular activities (Keskin & Metcalf, 2011). It is expected that by taking part in endless repeated rounds of 'test your vocabulary' close-ended drilling questions, app players will increase their vocabulary eventually. The following is a sample language drilling exercise that I was invited to design for a vocabulary learning app created for associate degree students in Hong Kong. In the app, users are encouraged to read a newspaper article every day. After the reading task, users will play the multiple-choice 'game' with their understanding. Behaviourist learning is reinforced in the learning process:

---

## Why Hongkongers have to be biliterate and trilingual

Since the 1997 handover, the SAR government has been implementing a language education policy that seeks to make students biliterate and trilingual [Question 1].

The goal is for students to master written Chinese and English while enabling them to speak fluent Cantonese, Putonghua and English.

But the government clearly lacked a clear and effective blueprint [Question 2] to allow Putonghua and English to permeate society.

When it comes to language planning, there virtually was none until 2003, when the Standing Committee on Language Education and Research issued an Action Plan to Raise Language Standards in Hong Kong.

Even so [Question 3], the fact that Cantonese remains the main language of communication means more effort is needed to promote the use of Putonghua and English.…...

*Leung Wai-mun is the co-author of this article which appeared in the Hong Kong Economic Journal on April 28*

---

| Question 1 | Question 2 | Question 3 |
|---|---|---|
| The prefix meaning 'two' is: | The part of speech of 'blueprint' is: | 'Even so' can be substituted by: |
| (a) Uni- | (a) Noun | (a) Yet |
| (b) Bi- | (b) Verb | (b) Even if |
| (c) Tri- | (c) Adjective | (c) Even though |

Many similar 'test your English vocabulary' apps in the market, such as *Atlas English Vocabulary* and *Magoosh*, also allow game players to choose the level of difficulty and select the vocabulary for different public exams, including TOEIC, TOEFL, GMAT, SAT, GRE, etc.

***Illustration 1.*** Behaviorist learning via an English vocabulary app (Evans, 2012)
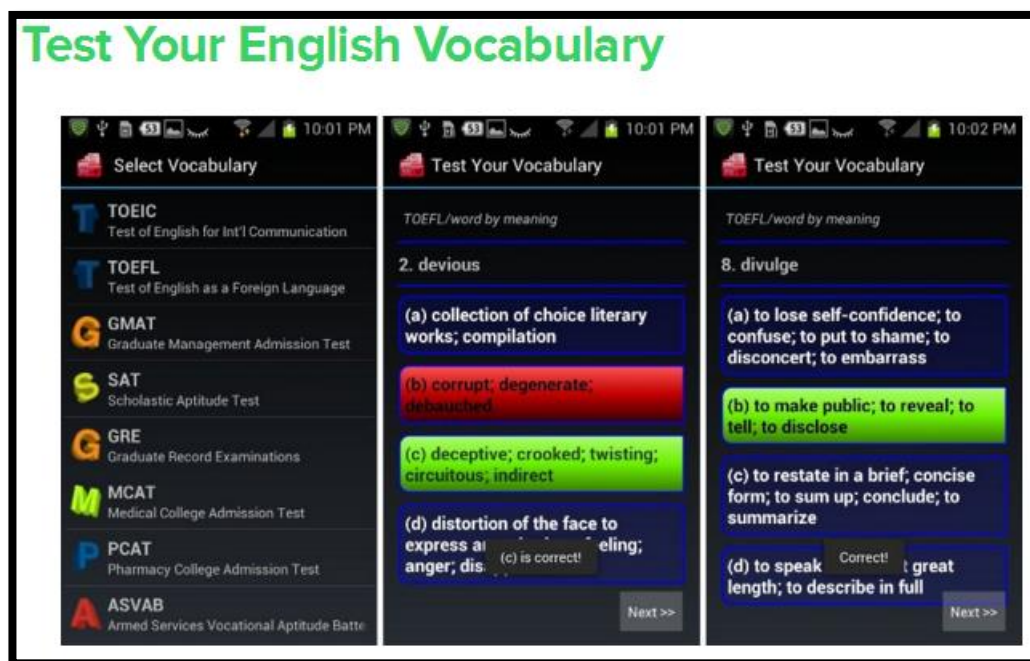


The growing market for exam drilling apps indicates their popularity among app users. However, one main drawback of such language apps is that they overtly rely their 'game' design on behaviourist learning. App players may find the 'game' boring soon. After all, the language app setting is decontextualized to a large extent. App users are just not given room to use the newly learned vocabulary in a natural and authentic setting. To engage app users, offering chances for behaviourist learning alone is not enough. Language apps designers shall need to include situated learning as well.

**Situated learning in task-based apps**

Situated learning, as Collins (1991) explains, "is the notion of learning knowledge and skills in contexts that reflects the way knowledge will be useful in real life" (p. 122). This is particularly important for language learning. Language knowledge is obtained and applied through authentic learning environments, where learners have the opportunity to experience the culture in the socially situated setting. Situated learning takes place when language apps embed learners in a realistic context in which authentic domain activities, situated mentoring, workplace learning occur (Keskin & Metcalf, 2011). Supporting tools are provided at the same time (Naismith et al., 2004). One perfect example of situated learning apps is *Resume Designer*, an app that plays the role of an employment agent. Having situated its app users in the job application setting, *Resume Designer*, alongside *CV Engineer*, *Resumaker*, *Top Resume* and other CV apps, guides users to follow the standard cover letter and resume formats step by step. As users write up their job application documents with *Resume Designer*, they will gradually learn the formal English vocabulary and professional writing skills for job hunting.

**Illustration 2.** *Resume Designer*, a task-based situated learning app (Adhiya, 2019).
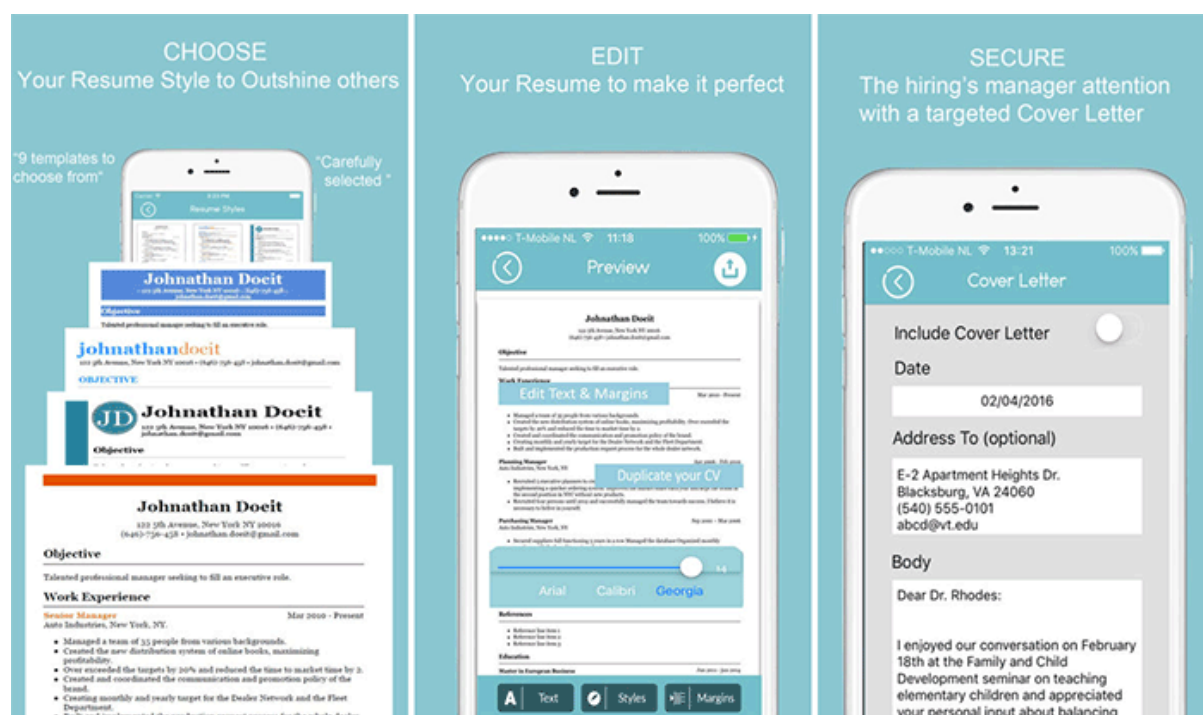


It is noteworthy that situated language learning does not necessarily happen only in language apps. Situated learning of English vocabulary can be a by-product which

app users earn as they engage in apps of other functions as well. For instance, when playing a task-based situated math app which requires players to apply their understanding of directions and measurement in various geographical simulated scenes, learners will, at the same time, gain math vocabulary for describing places and positions, map reading, grid references, directions, and compass navigation in English.

***Illustration 3.***   A math app that helps EFL learners build math vocabulary (Tso & Lau, 2018).
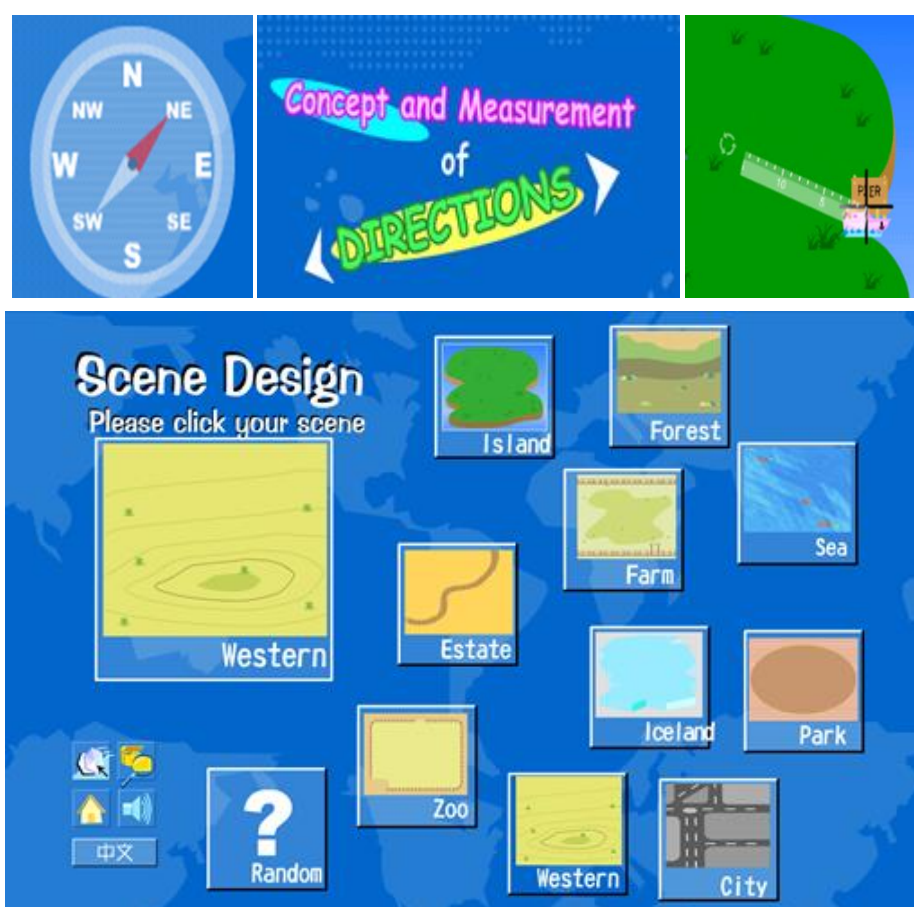


### *Constructivist learning in English creative writing apps*

Constructive learning is another equally effective way of building vocabulary. According to Harasim (2017), "[c]onstructivist theory posits that people construct their own understanding and knowledge of the world through experiencing the world […]. Our encounters with new ideas, new things and new perspectives require that we reconcile the new with our prior understanding" (p. 62). Simply put, constructivist learning takes place when learners construct new concepts, create innovative ideas and/or solve problems based on existing knowledge. Creative writing apps that invite users to experience the beauty of English language and encourage creativity involve

constructivist learning. Diamante Poem, a creative app popular among English teachers, is one such example. Guiding the user to follow the specific format of diamante poems, the app helps the user to categorize different parts of speech and select the right word form(s) for each line in the stanza. For example, EFL leaners who have learnt a range of adjectives and action verbs for describing seasons like summer and winter can apply what they knew in the poem writing app.

***Illustration 4.*** A constructivist app that helps EFL learners create poetry (Pyle, 2011).



***Collaborative learning in word game apps***

While creative writing apps encourage constructivist learning during lexical processing, vocabulary apps that enhance collaborative learning also help to keep players engaged in the game for the long term. "Collaborative learning is an educational approach to teaching and learning that involves groups of learners working together to solve a problem, complete a task, or create a product" (Laal & Laal, 2012, p. 491). It happens whenever there is social interaction where learners communicate, work and learn from one another. Apps that provide a shared learning environment for learners to communicate with other individuals (Naismith et al., 2004) involve collaborative learning. In GRE Word Game, vocabulary tests are given as a form of battles between opponents. Players from all over the world can choose to play with any random opponent of the same level or learn from an opponent from a higher

level. The collaborative learning packaged as competitions, together with the global player ranking, shall keep the player motivation going. The game play design is more attractive and addictive than language apps that allow no communication or competition other than that with the algorithm.

**Illustration 5.** *GRE Word Game*, a language app that allows competition and collaborative learning between players (GRE Word Game, 2019).
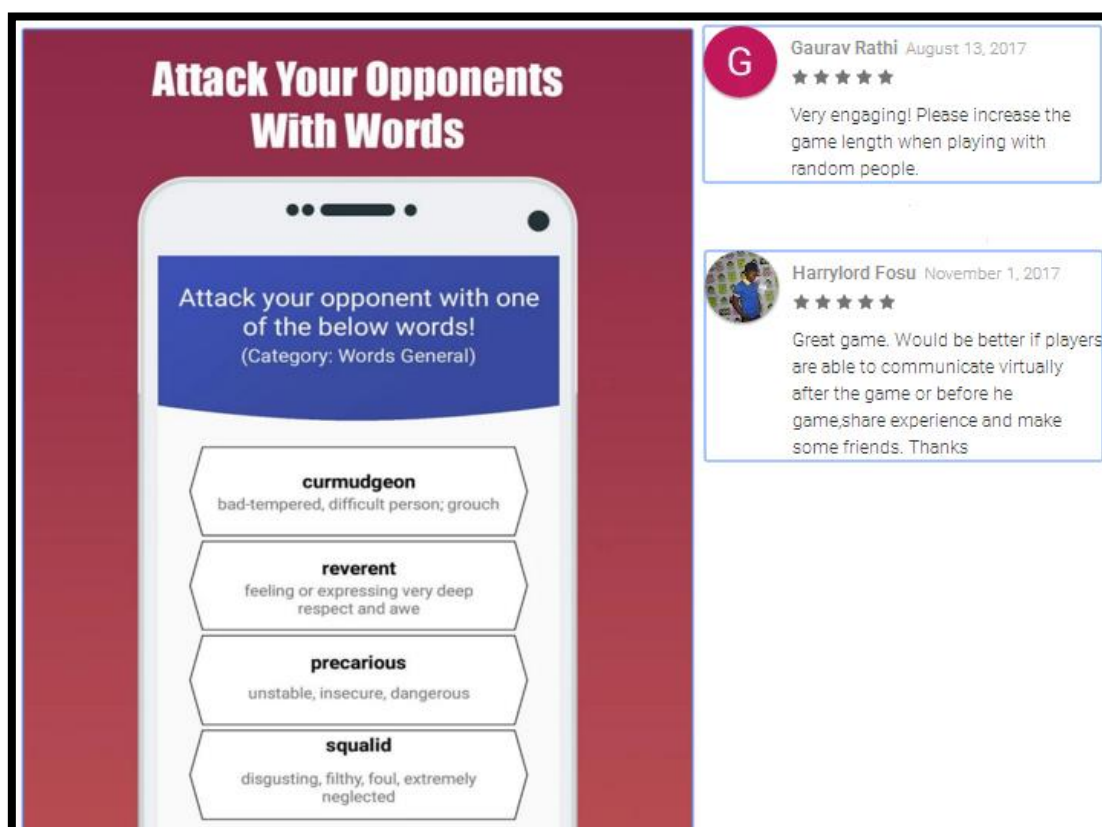


### Informal learning via casual apps

One reason why apps are appealing to users is that the informal learning they offer is undeliberate, non-threatening, and player-friendly. Informal learning "refers to that learning that takes place outside formal and non-formal education settings. As a process, informal learning refers to the way in which learning is acquired, regardless of the setting" (Duguid et al., 2013, pp. 24-25). Contrary to formal learning which strictly follows a structured syllabus with clear goals and objectives, informal learning usually occurs unintentionally outside the classroom. Informal learning takes place when language apps offer users a relaxing playtime. Vocabulary learning and building occur unintentionally when players play such word games as scrambles, hangman, word jumble, and spelling bee. A combination of rote memory, vocabulary knowledge, and understanding of spelling rules is involved in the game design.

***Illustration 6.***   A scramble app that enhances informal learning (Noire, 2012).
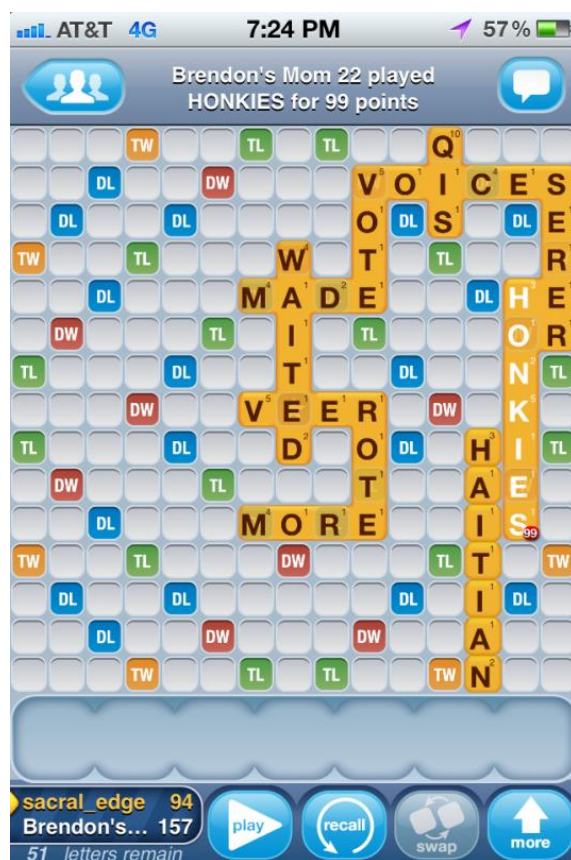


## Evaluating English language apps with Deng and Trainins' vocabulary learning theory (2015)

In addition to aligning apps learning experiences with key learning theories, EFL researchers also evaluate English language apps by aligning the app learning outcomes with the vocabulary learning strategies practised during lexical processing. According to Deng and Trainin (2015), there are four core vocabulary learning strategies (VLS), namely dictionary use, phonological analysis, morphological analysis, and contextual analysis. Compared with non-digital EFL teaching and learning materials, language apps have an absolute advantage when it comes to developing VLS with multimedia. For dictionary use, with a couple of clicks, EFL apps can provide instant voice search, example sentences, and audio pronunciation. Similarly, for phonological analysis, language apps, if well-designed, can give audio pronunciation and morpheme-grapheme correspondence with full visual annotations. As for morphological analysis, apps can easily offer clear and vivid animated presentations of word roots, prefixes, and suffixes along with the word meaning. The transmedia experience apps offer is not something that conventional textbooks can

compare. Last but not least, for contextual analysis, EFL apps are also able to give their users numerous texts of various topics for reading and listening. Readers can also conveniently review bookmarks, highlight quotations, jot notes, and check the online dictionary anytime they like. To sum up, the more an EFL app makes good use of the digital opportunities for enhancing VLS, the higher the quality of the app design in terms of vocabulary building.

## Common language apps used by EFL degree students in Hong Kong

In the student survey on VLS conducted in October 2019, undergraduate students were asked to name a number of recent English vocabulary learning apps which they found useful, enjoyable, and easy to use. To my surprise, not everyone mentioned digital games that encourage only behaviourist learning and informal learning. Instead, the following three EFL apps were mentioned most commonly by participants: *Merriam-Webster dictionary app*, *Hemingway app*, and *ABA English – learn English app*. In the following, I will discuss the effectiveness of these three EFL apps by using the two app evaluation grids which we walked through in parts 3 and 4.

### *Merriam-Webster dictionary app*

The convenience dictionary apps bring to users is unarguable, but different dictionary apps do have different target users. Not all dictionary apps are user-friendly for EFL learners. For example, the *Oxford English Dictionary* (OED), commonly known as the most authoritative English dictionary, is more geared towards academic purposes. Aiming to include all the words existing in the English language, the *OED app* contains various spellings, pronunciations, detailed etymologies, quotations of different ages. The *Merriam-Webster dictionary app*, on the other hand, serves the English learning and teaching purposes:

***Table 4.*** Evaluating the *Merriam-Webster dictionary app* as a vocabulary learning app

| Vocabulary Learning Theories / Education Theories | Dictionary Use | Phonological Analysis | Morphological Analysis | Contextual Analysis |
|---|---|---|---|---|
| 6. Behaviourist Learning | ✔ | ✔ | ✔ | |
| 7. Situated Learning | | | | |

| | | | | |
|---|---|---|---|---|
| 8. Constructivist Learning | | | | |
| 9. Collaborative Learning | | | | |
| 10. Informal Learning | ✔ | ✔ | ✔ | |

Concerned with helping EFL learners acquire the most frequently used English vocabulary, the *Merriam-Webster dictionary app* contains words of current usage along with example sentences, collocations, lexical relations (such as synonymy, antonymy, hyponymy and metonymy), pronunciation and voice search, study tools, grammar drilling and the like. For intermediate learners, it also offers the collegiate version with such functions as word game and word of the day. This may explain why the *Merriam-Webster dictionary app* and other dictionary apps alike, such as *Collins Dictionary*, *Longman Dictionary English* and *Cambridge Dictionary English*, are popular amongst Hong Kong tertiary students.

**Illustration 7.** *Merriam-Webster dictionary app* (Anker, 2019)
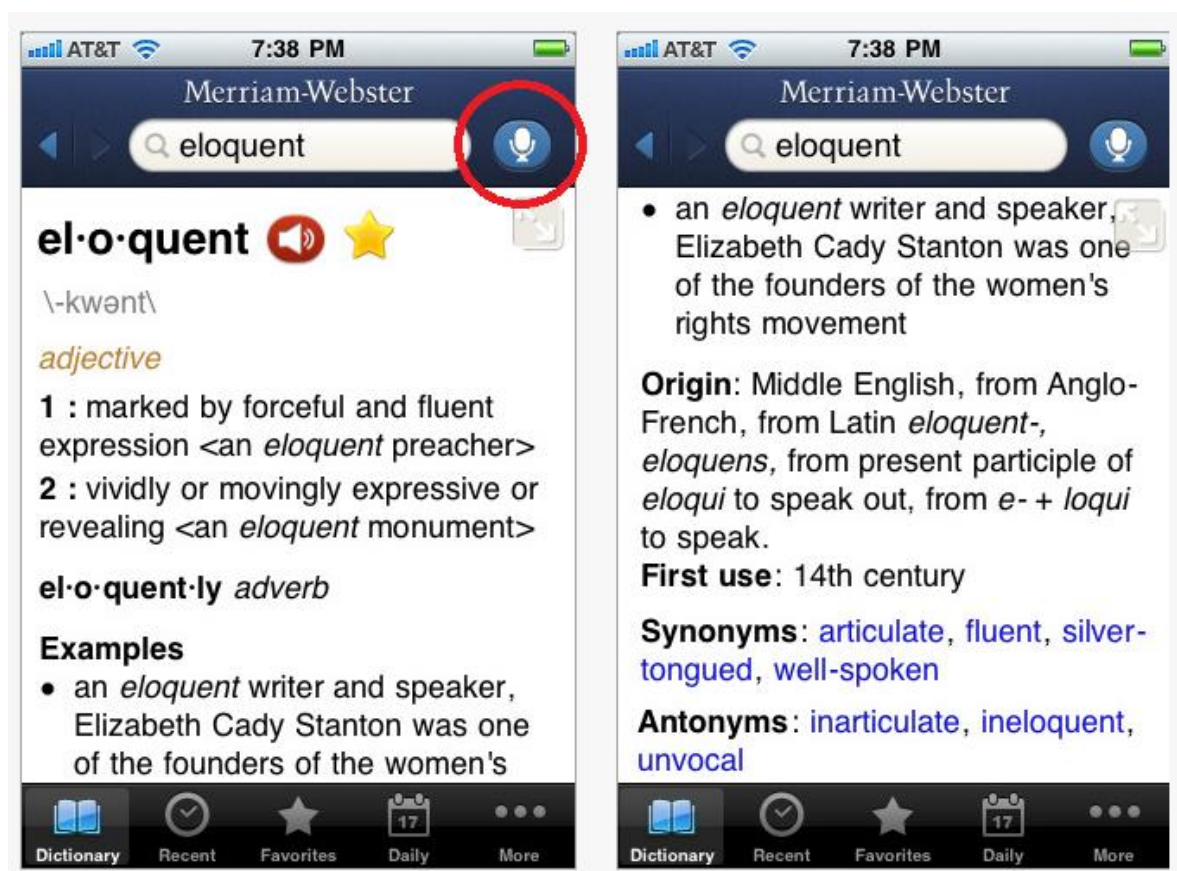
**Hemingway app**

Another language app which the survey participants found useful to their studies is the *Hemingway app.* As revealed by the student participants, before they submit their essay papers, they often use online grammar checkers. *Hemingway app* and *Grammarly* are among the most common grammar checker apps they use, but Hermingway app offers more than what EFL users expect, for it gets itself involved in the post-writing process. As the *Hemingway app* scans the term paper written in English, it grades the readability of the term paper. Like an English teacher, the app improves learners' writing by doing the plagiarism check, grammar check, contextual spelling check, as well as vocabulary enhancement:

**Table 5.**   Evaluating the *Hemingway app* as a vocabulary learning app

| Vocabulary Learning Theories / Education Theories | Dictionary Use | Phonological Analysis | Morphological Analysis | Contextual Analysis |
|---|---|---|---|---|
| 1.  Behaviourist Learning |  |  | ✔ | ✔ |
| 2.  Situated Learning | ✔ |  |  |  |
| 3.  Constructivist Learning |  |  | ✔ | ✔ |
| 4.  Collaborative Learning |  |  |  |  |
| 5.  Informal Learning |  |  |  |  |

As can be seen from illustration 8, the prompts for writing improvement are EFL learner-friendly. What the *Hermingway app* has highlighted in purple are words for which shorter synonyms are possible. The term paper author is then suggested a series of synonyms. Meanwhile, the app also shows signals to the term paper author which verbs may not be strong enough to stand alone in the passage. By and large, the *Hermingway app* is a language app effective for vocabulary building. Behaviorist learning, situated learning, and constructivist learning take place as learners use the app and have their VLS trained and improved.

**Illustration 8.** *Hemingway app* (Fraser, 2019).
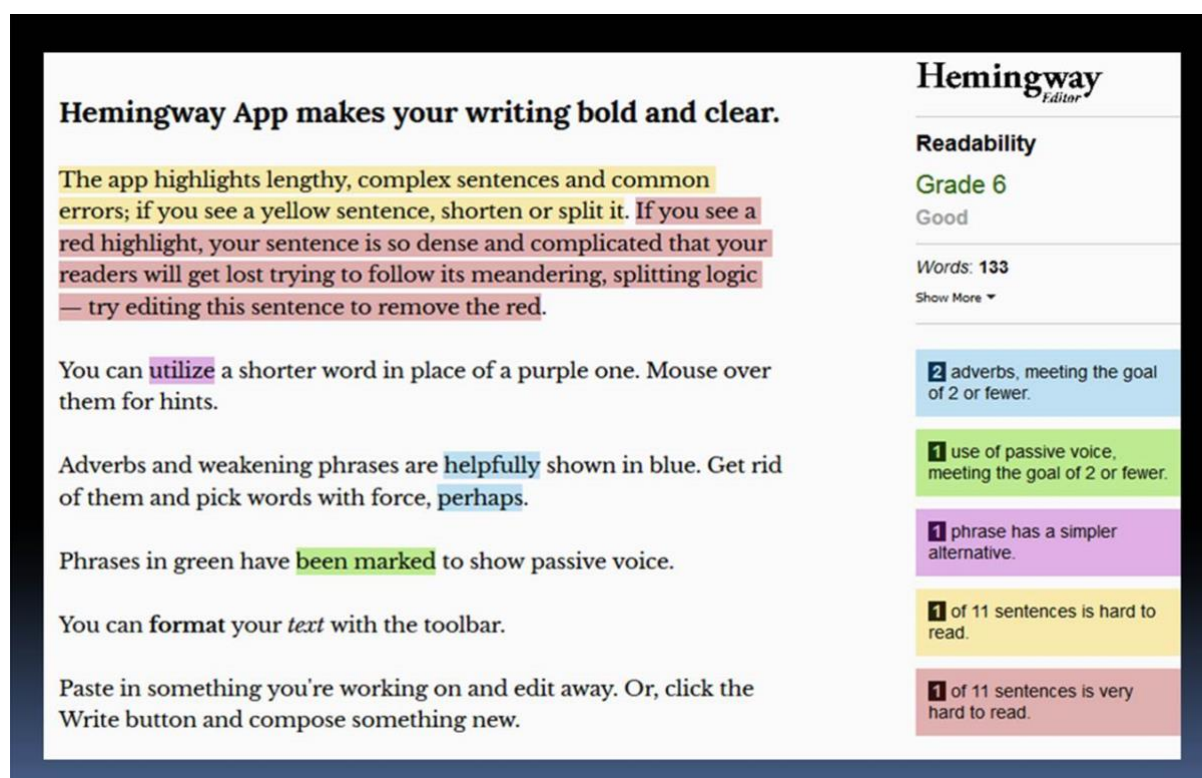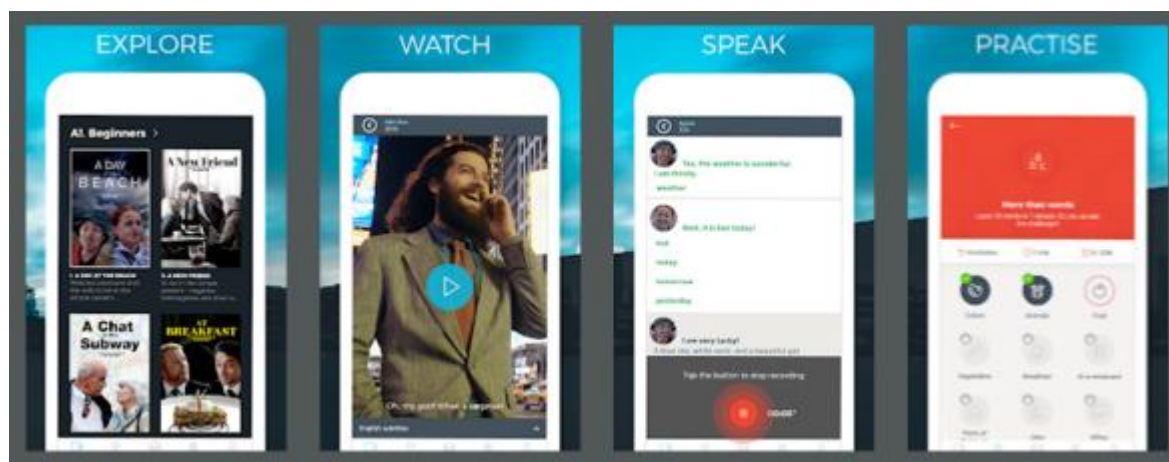


### ABA English – Learn English app

Besides online dictionaries and grammar checkers, ELF students who are eager to improve their English vocabulary also mentioned ABA English, a transmedia app that contains video classes of English grammar, online mentoring, and its highlighted feature – the English movies with subtitles (not Hollywood ones but ABA productions especially tailor-made for EFL learners of different proficiency levels), which are followed up by post-movie speaking, listening and writing exercises:

**Table 6.** Evaluating *ABA English – Learn English app* as a vocabulary learning app

| Vocabulary Learning Theories / Education Theories | Dictionary Use | Phonological Analysis | Morphological Analysis | Contextual Analysis |
|---|---|---|---|---|
| 1. Behaviourist Learning | | ✔ | ✔ | ✔ |
| 2. Situated Learning | ✔ | ✔ | ✔ | ✔ |
| 3. Constructivist Learning | | | | ✔ |

| | | | | |
|---|---|---|---|---|
| 4. Collaborative Learning | | ✔ | ✔ | ✔ |
| 5. Informal Learning | | | | ✔ |

***Illustration 9.*** *ABA English – Learn English app* (APA English application, 2019).



While learning via *ABA English* may be more time-consuming than other language apps, the language learning experiences it provides for learners are highly contextualized. This in turn allows room for brushing up learners' core VLS. In addition to vocabulary building, all five key types of learning also take place as users watch movies, engage in post-movie activities and work on English exercises. Just like *ABA English*, the *BBC Learning English* app facilitates English learning in more or less the same way too, except that the video lessons are based on the BBC news. The learning material is therefore more formal than those produced by *ABA English*.

**Conclusion**

Having overviewed the designs of a number of formulaic apps popular among language users in the tertiary sector in Hong Kong, this paper has put forward two evaluation grids for EFL vocabulary building apps: (1) learning approaches employed; and (2) vocabulary learning strategies enhanced. It is observed that most EFL vocabulary apps are able to develop behaviorist learning habits through close-ended questions and answers with model answers and programmed feedback. Effective EFL vocabulary app designs, however, do not only enhance behaviourist learning or informal learning. They usually allow room for creativity (constructivist learning) as well as situated and collaborative learning opportunities. Content wise, the most effective ones shall also be able to help learners grasp core vocabulary learning

strategies, which include vocabulary use, phonological, morphological, and contextual analysis. Nevertheless, beyond the theories and evaluation grids suggested, there are also other non-theoretical factors which cannot be measured. To obtain a fuller picture, further investigations that conduct real testing of students' performance before and after using the apps will be needed.

## Acknowledgements

## References

ABA English – Learn English app. [Online image]. Retrieve by November 15, 2019 from https://appcrawlr.com/android/ingles-gratis-con-aba-english

Adhiya, D. (2019). Resume designer [Online image]. Retrieved November 15, 2019 from https://www.igeeksblog.com/iphone-ipad-apps-to-create-resume/

Alqahtani, M. (2015). The importance of vocabulary in language learning and how to be taught. *International Journal of Teaching and Education, III*(3), pp. 21-34., DOI: 10.20472/TE.2015.3.3.002

Anker, D. (2019). Dictionary Merriam-Webster [Online image]. Retrieved November 15, 2019 from https://techlomedia.in/top-apps/offline-dictionary-apps-ios-android/

Collins, A. (1991). Cognitive apprenticeship and instructional technology. In L. Idol & B. F. Jones (eds.). *Educational Values and Cognitive Instruction: Implications for Reform* (pp. 121-138). Hillsdale, N. J.: Lawrence Erlbaum.

Deng, Q., & Trainin, G. (2015). Learning vocabulary with apps: From theory to practice. *The Nebraska Educator: A Student-led Journal*, *29*, pp. 49-69.

Duguid, F., Mundel, K., & Schugurensky, D. (2013). Voluntary Work and Informal Learning: A Conceptual Discussion. In F. Duguid, F. Mundel & D. Schugurensky (eds.). *Volunteer work, informal learning and social action* (pp. 17-36). Rotterdam: Sense Publishers.

El-Hussein, M. O. M., & Cronje, J. C. (2010). Defining mobile learning in the higher education landscape. *Educational Technology & Society*, *13*(3), pp. 12-21.

Ellis, R. (2003). *Second Language Acquisition*. Oxford: Oxford University Press.

Evans, D. (2012). Test your English vocabulary [Online image]. Retrieved November 15, 2019 from https://www.androidauthority.com/best-android-apps-improving-vocabulary-107606/

Fan, M. F. (2003). Frequency of use, perceived usefulness and actual usefulness of second language vocabulary strategies: A study of Hong Kong learners. *The Modern Language Journal*, *87*, 222-241.

Fraser, S. (2019). Hemingway app editor review [Online image]. Retrieved November 15, 2019 from https://www.squibler.io/blog/hemingway-app-review/

Gu, Y., & Johnson, R. K. (1996). Vocabulary learning strategies and language learning outcomes. *Language learning*, *46*(4), pp. 643-679.

GRE Word Game [Online image]. Retrieved November 15, 2019 from https://play.google.com/store/apps/details?id=com.buildmyvocab.greenglishgame&utm_source=appgrooves&utm_medium=agp_8d1f6c7539765c75320f80b0a9be2307_com.buildmyvocab.greenglishgame_us_others_15747927564449

Hamzah, M. S., Kafipour, R., & Abdullah, S. K. (2009). Vocabulary learning strategies of Iranian undergraduate EFL students and its relation to their vocabulary size. *European Journal of Social Sciences*, *11*(1), pp. 39-50.

Harasim, L. (2017). *Learning Theory and Online Technologies*. London and New York: Routledge.

Keskin, N. O., & Metcalf, D. (2011). The current perspectives, theories and practices of mobile learning. *Turkish Online Journal of Educational Technology-TOJET, 10*(2), pp. 202-208.

Kramarski, B., & Gutman, M. (2006). How can self-regulated learning be supported in mathematical e-learning environments? *Journal of Computer Assisted Learning*, *22*(1), pp. 24-33.

Laal, M., & Laal, M. (2012). Collaborative learning: What is it? *Procedia – Social and Behavioural Sciences*, *31*, pp. 491-495.

Liu, T. Y., Tan, T. H., & Chu, Y. L. (2009). Outdoor natural science learning with an RFID supported immersive ubiquitous learning environment. *Journal of Educational Technology & Society*, *12*(4), pp. 161-175.

Naismith, L., Sharples, M., Vavoula, G., & Lonsdale, P. (2004). *Literature review in mobile technologies and learning.* NESTA (National Endowment for Science Technology and the Arts), Bristol, UK.

Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.

Noire, Q. (2012). Diamante poems Words with friends [Online image]. Retrieved November 15, 2019 from https://creativeurbanista.com/2012/08/

Oxford, R. (2003). Toward a more systematic model Pf L2 learner autonomy. In P. Palfreyman and R. Smith (Eds.), *Learner autonomy across cultures: Language education perspectives* (pp. 75-91). New York: Palgrave Macmillan.

Pyle, A. (2011). Diamante poems [Online image]. Retrieved November 15, 2019 from http://www.sps186.org/teachers/apyle/winter_writing/?p=45688&i=222329&cat=0

Read, J. (2004). Research in teaching vocabulary. *Annual Review of Applied Linguistics, 24*, pp. 146-161., DOI: 10.1017/S0267190504000078

Schmitt, N. (1997). Vocabulary learning strategies. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition, and pedagogy* (pp. 140-155). Cambridge: Cambridge University Press.

Tso, W. B. (2019). Learning English as a foreign language through social media: First-hand perspectives from Hong Kong adolescents. In Will W. K. Ma, W. L. Chan & C. M. Cheng (Eds.), *Shaping the Future of Education, Communication and Technology* (pp. 107-115). Singapore: Springer.

Tso, W. B., & Lau, M. Y. (2016). Digital game-based learning: A case study of a digital educational game in Hong Kong. *Journal of Global Literacies, Technologies, and Emerging Pedagogies*, 3(2), 433 - 447.

Tso, W. B., & Lau, M. Y. (2018). Math apps [Image]. An explorative study on the pedagogical potential of gamification. In K. C. Li, K. S. Yuen, and B. T. M. Wong (Eds.), *Innovations in Open and Flexible Education* (pp. 143-152). Singapore: Springer.

Tso, W. B., & Lau, M. Y. (2019). Visitors' perceptions of a multimodal exhibition: A case study at the Hong Kong Heritage Museum. In A. W. B. Tso (Ed.), *Digital Humanities and New Ways of Teaching* (pp. 177-193). Singapore: Springer.

Wu, L. (2009). Incidental English vocabulary studying in L2 learning – A study of learning and teaching English vocabulary in a Chinese college (Unpublished master's thesis). Kristianstad University College, Kristianstad, Sweden.