

DIGITAL GAMES FOR VOCABULARY ACQUISITION IN LEARNING
ENGLISH AS A FOREIGN/SECOND LANGUAGE

A Dissertation

by

WENHONG GUO

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Chair of Committee, Fuhui Tong
Committee Members, Rafael Lara-Alecio
Beverly Irby
Oi-Man Kwok
Noelle Wall Sweany

Head of Department, Fuhui Tong

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ABSTRACT

English acquisition can be extremely difficult for EFL or ESL students because of the tedious experience of learning English words, which leads to less intrinsic learning motivation and poor learning outcomes. With widespread availability of mobile devices, digital games gain the advantage of multimedia, flexibility of time, and location. In this dissertation, English vocabulary acquisition through digital games for EFL/ESL context is explored.

The dissertation consists of three journal articles. Chapter Two is a literature review related to effectiveness of vocabulary digital games for EFL/ESL learners. Chapter Three is a content analysis of existing English vocabulary digital games for secondary EFL learners in the Chinese market. Chapter Four is an investigation of teacher perceptions on effective elements of vocabulary digital games for EFL context in China.

The results of this dissertation confirmed three points. First, a synthesis indicated that due to the lack of quality of existing studies, it was difficult to arrive at a conclusion whether digital game-based learning on vocabulary acquisition was effective for EFL/ESL or not. High-quality study in this area is needed. I recommended specific consideration should be given to educational design quality in future research. Second, the content analysis of digital games in English vocabulary learning suggested that limited learning opportunities were offered for EFLs in China and there was a lack of diversity for the use of pedagogical supports to satisfy the needs of secondary school

EFL students. The existing digital games may not provide high-quality learning facilitation for secondary students. Third, investigating EFL teachers' perceptions of an effective vocabulary digital game show three main themes and a total of eleven elements—diverse functions, daily life application scenario, proper amount of learning content for each level, play time control, cartoon art style, textbook related content, popular platform, enough practice, simple and smooth flow, vocabulary visuals, and theme-based vocabulary would be key elements for an effective English vocabulary digital game. It was recommended that educators and game designers should consider these key elements as an evaluation rubric or reference in digital game evaluation or design for English vocabulary acquisition.

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Contributors

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All other work conducted for the dissertation was completed by the student independently.

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CHAPTER I

INTRODUCTION

Words are elements of knowledge and communication (Jackson, Tripp, & Cox, 2011). Vocabulary words are the bricks of knowledge. The four domains of language learnings—reading, writing, speaking, and listening—are closely related to vocabulary. In terms of the comprehension of text, vocabulary is the major obstacle for language learners (Foil & Alber, 2002). Students must encounter a word forty times to achieve a maximum effect of mastering the word (Savino, 2011). Therefore, intensive work is needed for students to master words required for academic achievement.

With rapid advancement in technology, the widespread availability and use of mobile device grants today's language learners' convenient access to smartphones and tablets, which contributes to an unprecedented number of digital games for language teaching and learning capabilities (Campos, 2017). Compared to the limited class time in learning English as a foreign language (EFL) or English as a second language (ESL) in traditional settings, digital games possess the advantage of flexibility of time and location. In addition, English learners can easily lose motivation to continue learning English because of the overwhelming workload (Benoit, 2017); however, digital games can make the learning process more entertaining (Gee, 2005). Through digital platforms, tedious English vocabulary learning can be converted into an enjoyable learning experience.

Definition of Terms

ESL

English as a second language (ESL) refers to the roles of English for immigrants and minorities in native English-speaking countries like the United States, the United Kingdom, and Australia (Richards, Platt, & Weber, 1985). ESL, however, does not have to be a learners' second language (Nayar, 1997).

EFL

English as a foreign language (EFL) refers to the roles of English as a foreign language (Nayar, 1997). In countries like China, Germany, and Japan, English is not a native language; therefore, English instruction is EFL ((Richards, Platt, & Weber, 1985).

Digital Game-based Learning

According to Fullerton, there are eight common elements of games: players, objectives, rules, procedures, resources, conflict, boundaries, and outcomes (Fullerton, 2014). Game-based learning includes digital game-based learning and non-digital game-based learning. Non-digital game-based learning refers to the physical game-based learning in classroom while the digital game-based learning is game-based learning conducted on digital devices like tablets, computer, cellphones, etc.

Pedagogical Supports

In this study, *pedagogical supports* has the same meaning as the terms *instructional supports*, *pedagogical strategies*, or *instructional strategies*. In studies related to English vocabulary acquisition, these terms are usually used interchangeably (Larson & Rahn, 2015; Neuman, Wong, Flynn, & Kaefer, 2019; Wong & Neuman,

2019). Teachers and students may promote English language learning by applying vocabulary pedagogical supports such as clear and direct definitions and visual presentations of vocabulary (Wong & Neuman, 2019).

Statement of the Problem

There is no consistent claim about the effectiveness of digital games for English vocabulary acquisition (Ghaemi & Ebrahimi, 2015; Letchumanan & Hoon, 2012; Lucht & Heidig, 2013; Young & Wang, 2014). Moreover, discrepancy between the claimed effects and the documented results of educational multimedia exists in the marketplace. For example, The Joan Ganz Cooney Center found that in the application marketplace, across different platforms, there was a mismatch between what developers were designing and student needs (Neuman et al., 2019; Vaala, Ly, & Levine, 2015). Seventy percent of the applications lack long-run and deeper learning opportunities for vocabulary acquisition. Additionally, no studies on effective elements of English vocabulary learning through digital games exist; however, this knowledge of effective elements is critical for designing a high-quality educational digital game (Alexiou & Schippers, 2018; Vaala et al., 2015).

Purpose and Research Question

The primary interest of the current study is to explore the field of English vocabulary learning through digital games in EFL/ESL contexts. The following three research questions guided this study.

1. What does the existing literature say about the effectiveness of English vocabulary digital games for EFL/ESL?

2. What are the features of the existing English vocabulary digital games for secondary EFL in the marketplace?

3. What are the teacher-perceived key elements of an effective English vocabulary digital game for secondary EFL learners?

Significance of the Study

The current study is significant for its potential influence in the specific field of vocabulary learning through digital games for EFL/ESL language learners. My study contributes to the knowledge base of digital games for EFL/ESL context because elements necessary for these applications are identified, and suggestions are provided for future research and game design that can teach EFL/ESL learners to better capitalize the use of digital games.

Delimitations

The current overall study consists of three independent studies. The first two studies are reviews of existing literature or digital games; therefore, no data was collected. I collected qualitative data for the third study through semi-structured interview and coded the qualitative data using content and thematic analysis. A limitation of the three studies is that conclusions were not drawn based on quantitative data but literature reviews and qualitative data. The study analyses were influenced by the researcher, which required an intensely reflexive approach and a critical attitude towards the interpretation and summarization. To minimize the effect of this limitation, for each study, two researchers were introduced and participated in the coding and analysis process to increase reliability.

Organization of Study

This dissertation consists of three journal articles with five chapters which are described as follows.

Chapter One is an introduction of the overall study. It includes term definitions, a statement of the problem, the purpose of the study, research questions, significance of the study, and delimitations.

Chapter Two is a literature review related to effectiveness of vocabulary digital games for EFL/ESL learners. It includes an introduction, a conceptual framework, research questions, a description of the search process, findings, a discussion, and a conclusion.

Chapter Three is a content analysis of existing English vocabulary digital games for secondary EFL learners in Chinese market. It includes an introduction, a section defining the theoretical framework used, a methodology section, results, a discussion, limitations, and a conclusion.

Chapter Four is an investigation of teacher perceptions on effective elements of vocabulary digital games for EFL context. It includes an introduction, a literature review, a research question, a methodology section, results, a discussion, and a conclusion.

In Chapter Five, I present a conclusion about this dissertation study inclusive of findings from Chapters Two, Three, and Four.

CHAPTER II

THE USE OF DIGITAL GAME-BASED LEARNING ON ENGLISH AS A FOREIGN/
SECOND LANGUAGE (EFL/ESL) LEARNERS' VOCABULARY ACQUISITION: A
SCOPING REVIEW OF THE LITERATURE

Introduction

There is consensus among educators that words are basis of knowledge, expression, communication, and learning new knowledge (Jackson et al., 2011). Without grammar, language is confined to expression; but without vocabulary, expression is not possible (Wilkins, 1972). Vocabulary is also closely connected with the four domains of language learning: speaking, reading, listening and writing. A lack of vocabulary is the primary obstacle to students in comprehension of text (Foil & Alber, 2002). Words to knowledge is like bricks to a mansion. Additionally, it has been estimated that American elementary students must learn 3000-4000 words to acquire 25000 words after elementary school (Scott & Nagy, 2004) and 50000 words after high school education (Graves & Watts-Taffe, 2002). A variety of studies have shown a strong relationship between students' word mastery and academic achievement (Lee & Fradd, 1998; Sieber & Westmoreland, 2013; Stahl & Fairbanks, 1986). Greater exposure to words and words' meanings contributes to a greater understanding of the word (McKeown, Beck, Omanson, & Pople, 1985). It has been reported that to gain the maximum effect of understanding a word, students need to be exposed to it 40 times (Savino, 2011).

Therefore, the workload is massive for native English speakers to master the required vocabulary that leads to academic achievement.

Mastery of English vocabulary is more challenging for students who study English as a foreign language (EFL) or as a second language (ESL; Turgut & Irgin, 2009). Due to limited class time and required vocabulary workload, it is nearly impossible for learners to gain adequate vocabulary through a sole reliance on teachers' instruction in classroom (Wu, 2018). English learners in EFL or ESL settings often lose interest and motivation to learn English because of the frustration and overwhelming workloads required (Benoit, 2017; Chen & Chung, 2008). For example, Chinese college entry exams are the only criterion to go to college; as a result, English instruction is test-oriented. English teachers do not implement meaningful vocabulary activities in the classroom, because it is nearly impossible to have an engaging and effective vocabulary lessons due to limited class time and a required teaching content load. It is posited that acquiring a second language in classroom is restricted by the settings of the school; however, learning a second language or foreign language through online games can address such limitations by providing a better opportunity to acquire the target language (Thorne, Black, & Sykes, 2009).

Other methods and strategies need to be explored to enhance engagement and effectiveness of English learners in learning English vocabulary. Digital game-based learning can convert uninteresting English vocabulary learning into an interactive and enjoyable learning experience (Blunsdon, Reed, McNeil, & McEachern, 2003; Fullerton, 2014).

Conceptual Framework

Flow Theory and Affective Filter Hypothesis

Flow theory was proposed by Csikszentmihalyi (1990). It is the perception that when an individual is exposed to a flow state while participating in an activity, diverse positive emotions arise. In a state where one is fully occupied in an activity, they experience sense of control and cognitive pleasure, loss of self-consciousness, and possesses the balance and harmony between competence and the targeted tasks (Csikszentmihalyi, 1990). It is the joyful state of flow which contributes to robust intrinsic motivation to join the activity repeatedly. In fact, in the process of participating in the activity, different positive emotions (e.g. ease, pleasure, peace) are produced so that the people have a desire to experience it, which leads to strong inner motivation. If an individual is not in a flow state in learning activities, then negative emotions (e.g. boredom, anxiety, frustration) are generated in the process, which leads to the fall of intrinsic motivation to join in the same learning activity. Flow theory has been widely applied in various disciplines such as educational psychology, organizational psychology, and sport psychology (Cakmak et al., 2015). In the area of second language acquisition, Krashen's affective filter hypothesis proposed in 1982 resonates with the flow theory. This hypothesis is one aspect of Krashen's theory of second language acquisition. He suggested that language learners are supposed to have an inner filtering device. When negative emotion (e.g. fear, stress) arise in learning, a high active filter is activated, and they will not settle and receive input (Krashen, 1982). High active filters inhibit learners' acquisition. On the contrary, learners are inclined to acquire language in

an effective way when they experience positive emotions (e.g. comfort) with a lower affective filter. Based on flow theory and affective filter hypothesis, researchers have suggested that behind the learners' intrinsic motivation, is the matter of emotion, which has a far-reaching influence in student future achievement (Hagenauer & Hascher, 2014). Emotion in learning is critical, and educators should seek for instruction tools or strategies that can make students learn effectively in the flow of positive emotions, especially for EFL/ESL vocabulary learning which is notorious for being a boring learning experience.

Input Hypothesis

Input hypothesis is also one of Krashen's theory of second language acquisition. It states that language acquisition occurs only if learners are immersed in comprehensive input one step beyond their existing step (Krashen, 1982). It emphasizes comprehensive input and a developmental continuum ($i+1$) as well. Here, i is the previous input one learner already has, the new input is $+1$. Thus, the input number increases from $i+1$, $i+2$, $i+3$, etc. (Mitchell & Myles, 2004). If the amount of input is not enough, long-term memory of learning cannot be achieved due to the forgetting effect. Therefore, comprehensive input can facilitate to dissolve the forgetting effect and gain long-term retention. Undoubtedly, comprehensive input is necessary and critical for learners to memorize English vocabulary words and retain them for EFL/ESL.

Multimedia and Digital Game-based Learning

It is well known that human have five senses-- sight, hearing, taste, smell, and touch. Nearly all learners' positive emotions can be generated from a stimulus applying

to one of these five senses. Multimedia resources act as a carrier (e.g. text, picture, sound, video, animations) of multiple forms of information expression (Yue, 2017). Multimedia can disseminate information by featuring several types of carriers. For example, film can be one multimedia tool since it incorporates text, picture, sound, and animations. Compared to the single or limited carrier in information in traditional classrooms, using multimedia in instruction can maximize English language learners' ability to experience various senses and, therefore, positive emotions can be formed more easily in a learning process with comprehensive input (Wu, 2018).

With the development of computer technology, multimedia has been integrated with play which form digital games. Digital game-based learning (DGBL) can provide an autonomous learning environment in which learners can learn at their own pace with lower teacher-centered feelings (Young & Wang, 2014). Through playing games, students can gain experience in cooperation and communication which contribute to their self-regulated and active learning (Burguillo, 2010; Jong, Lai, Hsia, Lin, & Lu, 2013). Gee (2005) holds the view that video games make learning content more entertaining and effective. Game-based learning works directly with the psychological aspect of motivation. Among all the strategies for second language teaching, game-based learning constantly promotes motivation (Flores, 2015). Using digital games to improve students' enjoyment is important because there is a direct relationship between student enjoyment and learning (Blunsdon et al., 2003). Research has indicated that games provide a good environment to maintain and improve learning motivation in a mechanism of "play-learn-improve-win" (Malliarakis, Satratzemi & Xinogalos, 2013).

Sense of flow is connected to the fun experience which can be obtained by maintaining a balance between learners' ability and game's task or challenge. Therefore, it is important to keep an equilibrium between ability and challenge in game-based learning based on sense of flow when designing educational content. If the task challenge is greater than the player's ability, it will lead to anxiety and a resistance to continued play of the game. But if the task challenge is less than the players' ability, boredom will arise. Balance of skills and challenge can be achieved in a digital game when the educational design meets the players' prior knowledge level.

The widespread growth in availability and use of smartphones and tablets has facilitated an unprecedented rise in digital game-based learning (DGBL) for language acquisition. Due to its diverse optical and acoustic effects, which stimulate learners' enjoyment of sensation, DGBL has won popularity in foreign or second language learning (Dickey, 2011; Shih, Shih, Shih, Su, & Chuang, 2010). The mobile devices can also help DGBL gain advantage like flexibility of location and time for learning over traditional English classrooms.

The conceptual framework above can be presented in a conceptual model which is shown in Figure 1 below. This model integrated theories and concepts that rationalize the application of digital games on vocabulary learning for EFL/ESL students. Flow theory and affective filter hypothesis support that positive emotions aroused in the learning process are key to students' learning motivation. The input hypothesis indicates that for language acquisition, a sufficient amount of comprehensive input should be facilitated. Integrating both students' strong learning motivation and enough

comprehensive input can contribute to effective EFL/ESL vocabulary learning. As one form of multimedia, digital games can achieve this integration with its features and advantages.

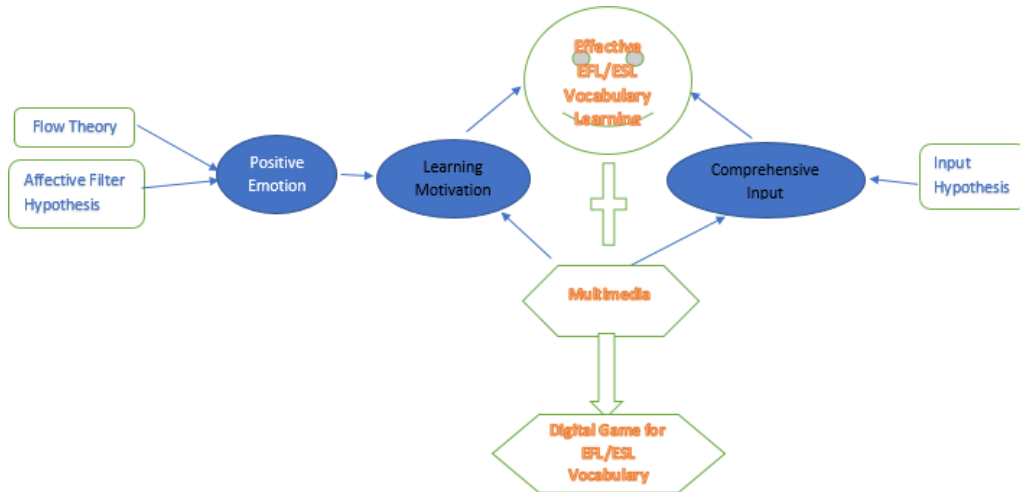


Figure 1. Conceptual Model of Digital Games on EFL/ESL Vocabulary Learning.

The purpose of this scoping review is to picture the study trend and characteristics and obtain some implications for future research in the application of digital games to English vocabulary learning in EFL/ESL context. Lin and Lin (2019) conducted a systematic review and meta-analysis for mobile-assisted L2 vocabulary learning including empirical studies between year 2005 to 2018. Compared to their study, this current literature only focused on studies related to English as a second or foreign language instead of incorporating all languages as second foreign languages. Second, their review included dissertations and conference papers which were not

included in this study. Third, in this study, meta-analysis was not conducted. Fourth, instead of only focusing on mobile applications (apps), my study incorporated all digital forms including computer software and websites. Lastly, I only reviewed studies that related to game function, but in their study, game or non-game function apps were all incorporated (i.e. online dictionary).

Research Questions

In this study, I tried to answer the following two overarching research questions

1. What were the basic descriptors in terms of sample size, geographical region, participants' educational level, research method, data source method, measure quality, EFL/ ESL, and theories supporting education design in the chosen articles?
2. Did the empirical studies demonstrate the effectiveness of digital game-based learning (DGBL) on English vocabulary learning on EFL/ESL?

Search Process

A scoping review provides value by examining a broad area to identify research gaps in current knowledge base (Crilly, Jashapara, & Ferlie, 2010), and it is used to map evidence such as published year, location (country), approach, etc. (Anderson, Allen, Peckham, & Goodwin, 2008). Based on Arksey and O'Malley (2005), unlike systematic reviews, which usually aim to examine the effectiveness of an intervention, a scoping review can examine broader key concepts underlying a research topic, and it may focus on one or more of these concepts. A scoping review can also lay the foundation for future systematic reviews (Tricco et al., 2016). Since the purpose of this current study

does not merely focus effectiveness of a particular intervention, it is appropriate to conduct a scoping review here.

Studies published from year 2005 to 2019 were covered in this review. I chose this time range as previous synthesis research results (Kukulska-Hulme & Shield, 2008; Duman, Orhon, & Gedik, 2015) captured data before this timeline and mobile-based vocabulary learning was not well explored before 2005 but achieved a peak in 2010. To capture relevant empirical research on the impact of digital game-based learning on vocabulary acquisition for EFL/ESL Learners, a search was conducted in the following eight electronic databases: Google Scholar, ERIC, PsycINFO, Education Source, Linguistics & Language Behavior Abstracts (LLBA), Academic Search Ultimate, Scopus and ProQuest. These requests occurred in November 2019 with the help from information professionals at Texas A&M University.

Inclusion and Exclusion Criteria

For the purpose of this study, only empirical articles from scholarly journals were included. Master's theses, doctoral dissertations, unpublished papers, abstracts, non-referred articles, and books were not included. Due to the limitation of my language ability, only those studies written in English were included in the review. A subsequent manual search was also applied to obtain additional publications from the reference lists of those papers found in initial search. It should be noted that studies related to EFL/ESL vocabulary applications without game functions were not included in the literature.

First, after searching all the identified databases and removing duplicates, a total of 40 articles were found. All titles and abstracts were then screened based on the

aforementioned selection criteria by two researchers. When titles and abstracts did not provide adequate information on whether the article met the criteria, the studies were included temporarily to guarantee the possible inclusion of all relevant studies. Those controversial studies were marked, and more attention was paid in a subsequent screening of the full texts. Interrater reliability score was calculated based on the abstract screening and it yielded a Cohen's kappa of 0.91. To achieve consensus, I carried further discussion colleagues on these disparities. For the first screening, a total of 31 articles were retrieved.

In the second screening of full texts, in addition to checking the inclusion or exclusion of the studies again, the following information from each article was also coded into a spreadsheet independently by two researchers: sample size, geological region, participants' educational level, research method, data source method, measure quality, EFL/ ESL, and theories supporting education design. The average interrater reliability across all coded variables was 0.87 (Cohen's Kappa). Again, all disagreements were discussed between the two researchers until they were resolved. Finally, 29 empirical studies (marked with❖in the references section) were selected for this review through two rounds of screening.

Findings

Basic Demographics

For each of the 29 studies, the paper's sample size was coded. As is shown in Figure 2 below, most of the sample sizes were below 50. It was rare that the sample size was above 150 (e.g., Ebrahimzadeh, 2017; Muhanna, 2012).

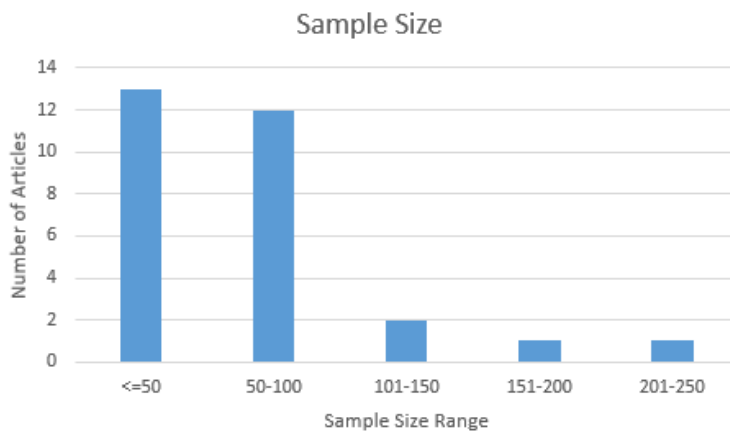


Figure 2. Sample Size Coding Outcome.

Because the empirical studies located were related to the area of EFL/ESL, nearly all of them originated outside the United States. For example, In the Chinese EFL context, there were eight studies conducted in Taiwan and two studies conducted in mainland China. In total, six studies were implemented in Iran, accounting for 22% of the literature. Three of the studies were conducted in Malaysia. In Jordan, Turkey, and Spain, two studies were conducted in each country. Lastly, one study was conducted in Germany, in Sweden, in Hongkong, and in the United States of America.

In terms of participants' grade levels, 49% of the studies were conducted in K-12, with 18% of the studies at the middle-school level, 7.4% at the high-school level, 7.4% at preschool level. At the postsecondary level, 37% of the studies looked at colleges and universities. Only one study, which accounts for 3.7% or the studies, was performed on adult ESL learners.

As for the research methods, three terms were used to code the studies: randomized controlled trial (RCT), quasi-experimental, and other. Shown in Figure 3

below, the majority of the literature adopted a quasi-experimental research method. RCT studies were rare. Other research methods accounted for a large proportion of the studies described. In studies labeled as “other”, their intervention might be applied to two groups of participants but without any random assignment like in RCT and quasi-experimental studies; their participants can be recruited voluntarily; the study can only have one group of participants; and the study might be just a case study.

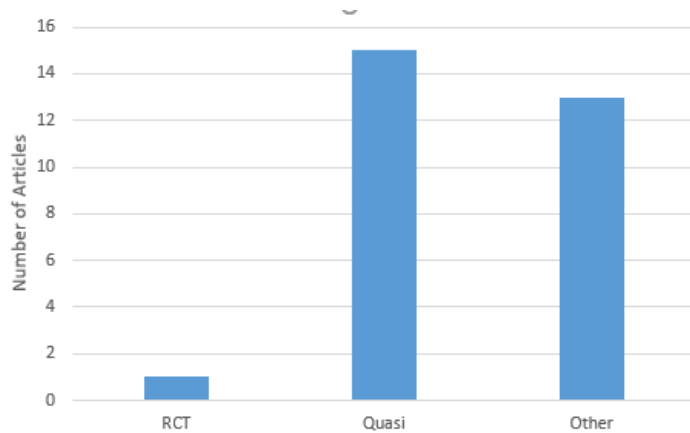


Figure 3. Research Method Coding Outcome.

As for the data type, among these 29 studies, 12 were quantitative studies. In the rest of the 17 studies, a mixed method including both quantitative and qualitative methods was adopted. There was no pure qualitative study.

In terms of measures used in these studies, vocabulary tests, questionnaire, semi-structured interviews, structured interviews, written essays, observations, students’ photos, student journals, and system log files were used for measurement purposes. However, regarding the reliability and validity of the instruments they applied, few of

them reported reliability or validity tests. Due to the complexity of use of various instruments, studies were coded using two terms: “mention reliability or validity” and “no mention at all.” Indicated in Figure 4, most of the studies in the literature did not mention the reliability or validity of the instruments used.

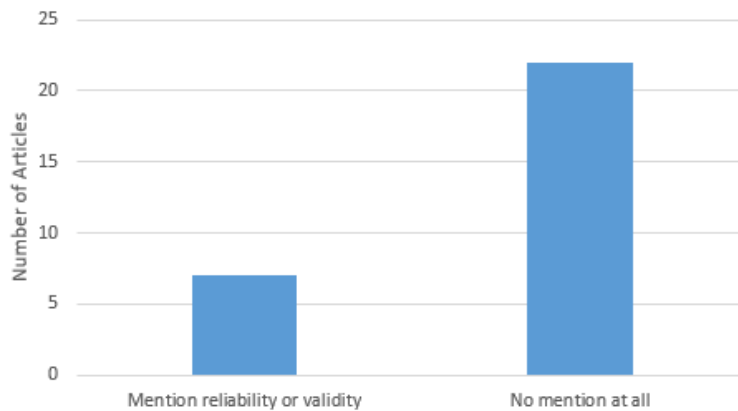


Figure 4. Instrument Quality Coding Outcome.

The terms of EFL and ESL were used interchangeably but improperly in some studies. I argue that the difference between EFL (English as a foreign language) and ESL (English as a second language) is “the native language of the country in which instruction is being given” (“Core Languages,” 2019; Nayar,1997). ESL classrooms exist in native-English speaking countries like the United States of America, the United Kingdom, and Australia, and EFL is more often found in countries like China, France, and Spain where English is not the primary national language. As shown in Figure 5, 96% the papers in the literature were EFL and only one study focused on ESL. However,

there are nine studies in the literature adopted the improper term for their studies, using ESL when they should have used EFL.

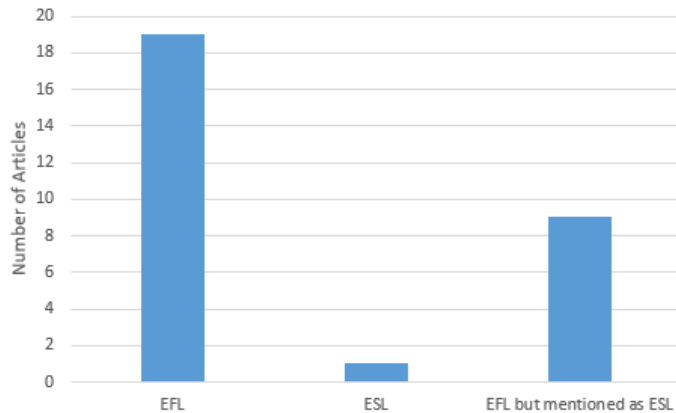


Figure 5. EFL and ESL Term Usage Coding Outcome.

In terms of the theories mentioned to support education design, only four studies provided such information. Hao, Lee, Chen, and Sim (2019) introduced the cognitive apprenticeship model to guide the design of education part of their game. They used cognitive apprenticeship to show that learning should occur within a social context and that the process of demonstration, teaching, and experts supports were critical (Collins, Brown, & Newman, 1989). In the study of Chen and Lee (2018), an application-driven model including application scenario, subject learning, and learning regulation was introduced to guide their game design, particularly for the education part of the game. Hwang and Wang (2016) proposed a “situated computer game-based learning model” which was adapted from Kiili’s (2007) problem-based gaming model. Bakar and

Nosratirad (2013) mentioned that the game selected was based on the adult learners' self-directed learning (Garrison, 1997; Merriam, 2002).

Effectiveness

As for the effectiveness of vocabulary digital games, the vocabulary learning achievement was used to decide whether the game was effective or not. The results of the effectiveness of 29 articles are shown in Table 1. In the majority of the studies reviewed, English vocabulary digital games were investigated as an effective tool to improve students' vocabulary learning. For instance, in the study by Vahdat and Behbahani (2013), a serious digital game was applied to the experiment group to learn the new ESL vocabulary while the control group maintained traditional teaching methods. Significantly higher scores were found among the experiment group over the traditional learning methods in the control group. The authors also reported that in the experimental group the male students performed better than the female students. In a Jordan-based study, Muhanna (2012) investigated the effect of digital games among 160 10th grade Jordanian students. The findings indicated that the experimental group was more successful in the vocabulary test compared to the control group which showed that the digital game was effective in EFL vocabulary acquisition. However, there was no difference found in vocabulary achievement between male and female students. Similarly, Alsharafat, Alrashdan, and Younes (2017) conducted a quasi-experimental study among 97 third grade students to examine the effect of an educational computer game. The findings indicated that the experimental group with the digital game outperformed the control group students in English vocabulary improvement.

Additionally, they found that female students performed better than male students using the digital game. In mainland China, Zhonggen (2018) conducted a randomized controlled trial among 109 university students. They divided participants into three groups—a group with an interactivity-prone digital game, a group with a less interactivity-prone computer game, and a group with pencil and paper when learning English vocabulary. It was indicated that students using the interactivities-prone computer game outperformed students using the less interactivity-prone computer game in the English vocabulary tests. In addition, two groups of students using digital games outperformed students using traditional pencil and paper. They also found that male students performed better than female students among students involving in digital games.

However, in three studies, digital games were found to be ineffective in enhancing students' English vocabulary achievement. Ghaemi and Ebrahimi (2015) compared the effects of a digital game, a non-digital activity game, and traditional instruction on 36 Iranian elementary students. It was found that the non-digital activity game group students performed better at both vocabulary and sentence retention in oral achievement tests. In this study, seemingly, the physical game was more effective than digital games. For the Chinese native speakers in Taiwan, Young and Wang (2014) conducted a study among 52 elementary students to compare two instruction strategies. In the experiment group, students experienced both drill and digital game practice in learning English vocabulary while in the control group, only drill practice were applied. The results indicated that the experiment group participants did not outperform the

control group in the vocabulary outcome. But in the game-based scenario, learners' anxiety was reduced, and flexible chances were provided for students to practice. Lucht and Heidig (2013) conducted studies among 113 German elementary students to examine the effect of combining a physical activity (HOPSCOTCH) and a digital game compared to a teacher-centered instruction. The results indicated that the integrated digital game was not effective in students' vocabulary learning. However, students reported better attitudes towards the game.

Table 1*Effectiveness Coding for Each Study*

Author(s)	Year	Effectiveness	Research Paradigm	Geological Region
Aghlara & Tamjid	2011	Yes	quantitative	Iran
Aslanaba & Rasouli	2013	Yes	quantitative	Iran
Vahdat & Behbahani	2013	Yes	quantitative	Iran
Ashraf, Motlagh, & Salami	2014	Yes	quantitative	Iran
Ghaemi & Ebrahimi	2015	No	quantitative	Iran
Ebrahimzade	2017	Yes	quantitative	Iran
Muhanna	2012	Yes	quantitative	Jordan
Alsharafat et al.	2017	Yes	quantitative	Jordan Mainland
Smith et al.	2013	Yes	quantitative	China
Chen et al.	2018	Yes	quantitative	Taiwan
Kocaman & Cumaoglu	2014	Yes	quantitative	Turkey
Letchumanan et al.	2015	Yes	quantitative	Malaysia
Young & Wang	2014	No	mixed method	Taiwan
Hwan & Wang	2016	Yes	mixed method	Taiwan
Wu & Huang	2017	Yes	mixed method	Taiwan
Wu	2018	Yes	mixed method	Taiwan
Chen & Lee	2018	Yes	mixed method	Taiwan
Hao et al.	2019	Yes	mixed method	Taiwan
Chen, Liu, & Huang	2019	Yes	mixed method	Taiwan
Yip & Kwan	2006	Yes	mixed method	Hongkong Mainland
Zhonggen	2018	Yes	mixed method	China
Letchumanan & Hoon	2012	Yes	mixed method	Malaysia
Bakar & Nosratirad	2013	Yes	mixed method	Malaysia
Cerezo, Calderón & Romero	2019	Yes	mixed method	Spain
Calvo-Ferrer	2017	Yes	mixed method	Spain
Lucht & Heidig	2013	No	mixed method	German
Sundqvist & Wikström	2015	Yes	mixed method	Sweden
Urun, Aksoy,& Comez	2017	Yes	mixed method	Turkey
Ranalli	2008	Yes	mixed method	USA

Discussion

The review of the literature in this chapter revealed that the amount of research related to digital game's application on EFL/ESL's English vocabulary learning is severely limited. Surprisingly, there are only 29 empirical studies which fit the suggested criteria. In addition, the sample size of these studies is relatively small and most of studies' sample sizes are below 100. Considering the geographical regions of these studies, Taiwan and Iran are two areas where more empirical research is available in this particular field. In terms of the participants' grade levels, graduate students in universities were participants most frequently studied by researchers, followed by elementary students and middle school students. Preschool children, high school students, and adult EFL learners out of school gained less attention from researchers in the field of digital game-based learning compared to EFL at other educational levels. In regards to the research methods adopted in the literature, it was notable that no purely qualitative study was found; instead, the studies found were all quantitative or mixed method that includes both quantitative and qualitative approaches. Among the 29 empirical studies, most of them are quasi-experimental studies or one-group intervention studies without a convincing experimental design. There was only one RCT, which was the most rigorous research design (Deaton & Cartwright, 2018). In a majority of the studies using an instrument, seemingly, the instrument reliability is questionable because there was no reliability or validity information provided in the accompanying papers. Therefore, high quality studies with instrument reliability reports are desperately needed. In addition, some researchers in the literature used the terms EFL and ESL improperly,

and only 14% of the studies gave information about the theories that were used to guide the educational design of the games.

Based on my analysis of the 29 empirical studies, in the majority of the studies, 26 studies, there is an agreement among researchers that digital game-based learning (DGBL) is a favorable tool for EFL vocabulary learning. However, there is a discrepancy between three studies and the majority. According to the results of Ghaemi and Ebrahimi (2015), non-digital game group students outperformed students who were in the digital group students at vocabulary achievement. Similarly, in the study of Young and Wang (2014), the results indicated that students in the digital game-based group were not more successful in vocabulary acquisition outcomes compared to students who were in a non-game scenario. Also, in a study conducted by Lucht and Heidig (2013), they found that an integrated digital game did not improve students' vocabulary learning even though students reported better attitudes towards the game. Participants in these three studies were all elementary students. Therefore, the effectiveness of digital games on vocabulary achievement still needs to be investigated further and confirmed among elementary school students in future research.

According to the findings, it should also be noted that there is a discrepancy in effectiveness related to student gender. In the quasi-experimental conducted by Alsharafat et al. (2017) among elementary school students, researchers found female students outperformed male students in English vocabulary achievement with the same use of a digital game. However, in another study conducted by Zhonggen (2018), he found that male students outperformed their female peers in a digital game in terms of

English vocabulary. Therefore, the different effects of digital game-based learning on male and female students still need to be further examined.

Conclusion

In this scoping review I synthesized 29 empirical studies in the specific area of game-based learning for English vocabulary for EFL or ESL learners. Even though the majority of the studies were in favor of the use of digital games for English vocabulary learning according to the effectiveness of their experiment, I question the effects of their experiments due to the lack of quality in the research design and implementation. In addition, most of studies did not provide information related to the theories or premises that were embedded in the educational digital games they selected. Therefore, it was difficult to know how the game produced an effect on students in terms of the education design. There is an urgent need for high-quality experimental studies with a greater focus on educational design to be conducted.

CHAPTER III

LEARNING VOCABULARY: A CONTENT ANALYSIS OF PEDAGOGICAL SUPPORTS IN DIGITAL GAMES FOR ENGLISH AS A FOREIGN LANGUAGE (EFL) LEARNERS IN CHINESE SECONDARY SCHOOLS

Introduction

Around the globe, the widespread growth in availability and use of mobile devices like smartphones and tablets allows adolescents to be more exposed to technology as a daily habit, which has facilitated an unprecedented number of new digital games with language learning and teaching capabilities. The digital game consumers are often younger, and in 2018, 200 million Chinese adolescents were consumers of online digital games (“There are more than 200 million Chinese adolescents becoming online game players: Only the person who eat chicken can have friends,” 2019). Over the past five years, the Chinese government tried to cool down this trend by releasing “online game curfews” to prohibit juvenile and adolescents’ daily use of online games (Cyberspace Administration of China, 2016). Characterized by inconsistent claims about quality and effectiveness of educational multimedia, young students, educators and even parents have had to explore and navigate this relatively new domain by themselves. After examining the marketplace on different platforms and apps, the Joan Ganz Cooney Center (Neuman et al., 2019; Vaala et al., 2015) revealed that there is a fierce mismatch in what multimedia developers were creating (e.g., apps, websites, featured e-books) and what students actually needed. For instance, 70% of the

apps inspected were characterized by testing-based activities or competitive activities in puzzles, games, or quizzes but lacked in deeper and long-term knowledge development opportunities for vocabulary acquisition.

In the field of language acquisition, words are the bricks of expression, knowledge and communication (Jackson et al., 2011). There is a close relationship between students' vocabulary size and their academic achievement (Stahl & Fairbanks, 1986). However, for students who learn English as a foreign language (EFL), English acquisition can be highly difficult (Turgut & Irgin, 2009). In addition, English vocabulary memorization is often considered a tedious and passive experience which makes students less motivated toward English acquisition, which can lead to poor learning outcomes (Chen & Chung, 2008). It is almost impossible for English learners to acquire adequate vocabulary words during classroom because of the limited class time and large required vocabulary workload (Wu, 2018). For instance, in China, English learners in middle school and high school encounter pressure to learn English because it is necessary for their admission exams to the next educational level. Even though the requirement varies across different provinces, middle school students in China need to master approximately 2500 English vocabulary words for the admission exams to high school and high school students need to master approximately 4000 English vocabulary words for the admission exams to university (zhidao.baidu.com, 2019). However, the English instruction for those students at secondary school level is test-oriented, and there is not enough comprehensive input in English classes (Yan, 2012).

Theoretical Framework

Given the target learner population, I grounded my study in Krashen's input hypothesis. It states that if learners receive comprehensive input one level beyond their present level, language acquisition occurs (Krashen, 1982). It emphasizes that comprehensive input is on a developmental continuum, i.e., $i+1$. If i is the previous input one language learner already possess, the new input is $i+1$; therefore, the input amount increases from $i+1$ to $i+2$, $i+3$, etc. (Krashen, 1982; Mitchell & Myles, 2004). If the input amount is limited, long-term memory of learning content will not be formed due to the effect of forgetting. Comprehensive input can conquer the forgetting effect and help students learn for long-term retention. There is no doubt that in order to memorize EFL vocabulary for long-term retention, comprehensive input is critical.

Additionally, my study is informed by two theories which support educational digital games as a good platform for vocabulary acquisition in EFL learners. Flow theory is the notion that when an individual experience a flow state while performing an activity, various positive emotions arise. In these "flow" experiences, people are fully immersed in the activities, feel cognitive pleasure and sense of control, lose self-consciousness, and possess harmony between skills and targeted tasks (Csikszentmihalyi, 1990). It is an enjoyable state of flow which leads students to have strong intrinsic motivation to perform the activity again and again. In fact, in the process of performing the activity, various positive emotions (e.g. ease, pleasure, peace) are generated so that the individual aspires to experience it again. If learners are not in a "flow state" in learning, then negative emotions (e.g. anxiety, boredom, frustration) are

produced in the process. Negative emotions can lead to a loss of intrinsic motivation to participate in the same learning process. Flow theory is widely applied in diverse disciplines such as sports psychology, organizational psychology, and educational psychology (Cakmak et al., 2015). This theory can also be applied to EFL as digital games may provide dynamic “flow state” experiences that serve as scaffolds for learning vocabulary words. The second theory is Neuman’s (2009) synergy assumption. It suggests that multimedia representation can produce a mental presentation of educational content which can assist in knowledge retrieval and strengthen understanding. In fact, multimedia features such as animations, zoom shots, and sound effects allow actions to become more immersed because they can direct EFL learners’ attention to intentional details that reinforce the understanding of education content.

In foreign language learning, digital games have gained popularity among learners because of their various optical and acoustic stimuli (Dickey, 2011; Shih et al., 2010). Updated mobile devices also help digital games to claim the advantage of flexibility of time and location compared to traditional English classrooms.

Regarding the effectiveness of instructional supports on vocabulary learning especially on the platform of digital games, Bytheway (2015) conducted semi-structured interviews and observation on seven university students who were ESL learners and tried to get a taxonomy of vocabulary strategies used in massively multiplayer online role-playing games (MMORPGs). Even though participants reported a set of instructional strategies, they only recommended two strategies--“interacting with players” and “playing in English.” Yudintseva (2015) conducted a systematic review for

qualitative and quantitative studies related to students who learn English as a second language (ESL); it was suggested that game-enhanced learning can offer effective strategies such as dictionaries, word lists, language repetitions, vocabulary exercises, and contextual clues. In addition, notetaking and media-related strategies produced less effective learning for vocabulary acquisition because of the high interactivity. However, Yudinseva (2015) also admitted that existing studies he reviewed lacked both empirical data and high quality.

The need for high-quality educational digital games in the marketplace is high, especially for English vocabulary learning games (Vaala et al., 2015). However, few studies have been published that investigate the quality of vocabulary digital games in regards to instructional supports, inside and outside of the Chinese market (Bytheway, 2015; Yudinseva, 2015). The current study is designed to examine the educational quality of existing vocabulary digital games for secondary level of English students in China in view of the importance of English language acquisition for the admission exams.

With the potential to achieve comprehensive inputs and engage EFL learners in flow status learning experiences, I aimed to examine learning opportunities for vocabulary acquisition and to examine how digital games used pedagogical strategies to develop vocabulary words. In this content analysis, processes of vocabulary instruction were investigated to evaluate the educational quality of existing digital games for EFL vocabulary learning. Particularly, the two research questions below guided my research.

1. What pedagogical supports are reflected in digital games used by Chinese secondary EFL learners to acquire vocabulary?
2. What are the characteristics of the usage of pedagogical supports?

Method

The section below presents a mixed methods approach in which evaluative methods and quantitative methods were adopted to examine the research questions (Wong & Neuman, 2019). More specifically, in this content analysis, I used evaluative methods to form pedagogical supports reflected in sample digital games and quantitative methods to analyze frequency of usage for different strategies in a Chinese EFL context. Content analysis is a research method that can be used to subjectively and systematically evaluate and summarize the formal aspects of the targeted material based on a research aim. The object of a content analysis can be texts including discourse, documents, transcripts of interviews, video tapes, and protocols of observations (Mayring, 2004). For online interfaces like interactive multimedia and applications, the content analysis was used to mine text and, using emergent and theoretical coding schemes, to analyze messages carried (Neuendorf, 2002). Through content analysis, qualitative data can be transformed into quantitative data, and both qualitative and quantitative operations are used in the most convincing content analysis studies (Weber, 1990).

Context

In China, the government regulates that during compulsory education, students should develop all four basic skills of listening, speaking, reading and writing in English (English Curriculum Standards for Compulsory Education, 2010). However, secondary

English teaching, which is part of compulsory education, is mainly for academic language even though social language is also involved. For instance, in the English admission examination to universities, grammar, reading, writing and listening are emphasized, but oral English is not required or tested. In addition, in China, English is not one of official languages used in daily life like in Singapore, so there are few opportunities for students to practice English social language in authentic situations.

Sample of Educational Digital Games

An online search was used to identify all vocabulary digital games available for EFL students at secondary level in China. Since a digital game can be a website game, an application game, or both, I searched both on application stores via mobile phones and the most popular search engine in China—Baidu. I used two Chinese search terms—“初中英语词汇游戏/软件(Middle school English vocabulary game/software)” and “高中英语词汇游戏/软件(high school English vocabulary game/software)”. As I sifted through the digital games, I selected the programs that fit the following criteria (a) must have stated objective for players to learn English vocabulary and (b) must have clear statement that it is a digital game rather than just electronic and verbal versions of vocabulary books. From application stores, ten games for middle and high school students were identified, and I found one website game from search engine. Based on the search and examination procedure above, a list of eleven online available English vocabulary digital games produced in China were identified. These games specifically targeted middle school and high school students. After the first round of exploring these games, I deleted four games because the game and educational design were the same for

two games, and the only difference was that one was for middle school students and one was for high school students, which means they had the same sets of pedagogical supports. Finally, seven English vocabulary digital games were investigated in this content analysis for pedagogical supports (Table 2). Three are solely for middle school students, and four have the same version for both middle school and high school students. None of these games is for multiplayer, so students cannot interact with other students.

Table 2

Digital Games Included in the Sample

Games	Target Student	Game Type	Based on Textbooks
1. 初中英语单词通	Middle	App	Yes
2. 初中英语单词同步学	Middle	App	Yes
3. 初中英语单词听写测试	Middle	Web	Yes
4. Hujiang Fun 沪江开心词场	Middle and high	App	Yes
5. Word Castle 单词城堡	Middle and high	App	No
6. 英语消消乐	Middle and high	App	Yes
7. 秒背单词	Middle and high	App	Yes

Content-Analytic Procedure

The content-analytic procedure adopted to review vocabulary learning opportunities and develop a codebook of pedagogical supports was based on the study of Wong and Neuman (2019). Even though their study was specifically related to educational TV programs for dual language learning rather than digital games for EFL learning, to some extent, the underlying mechanism is similar for screened media and digital games. The procedure is shown in Figure 6.

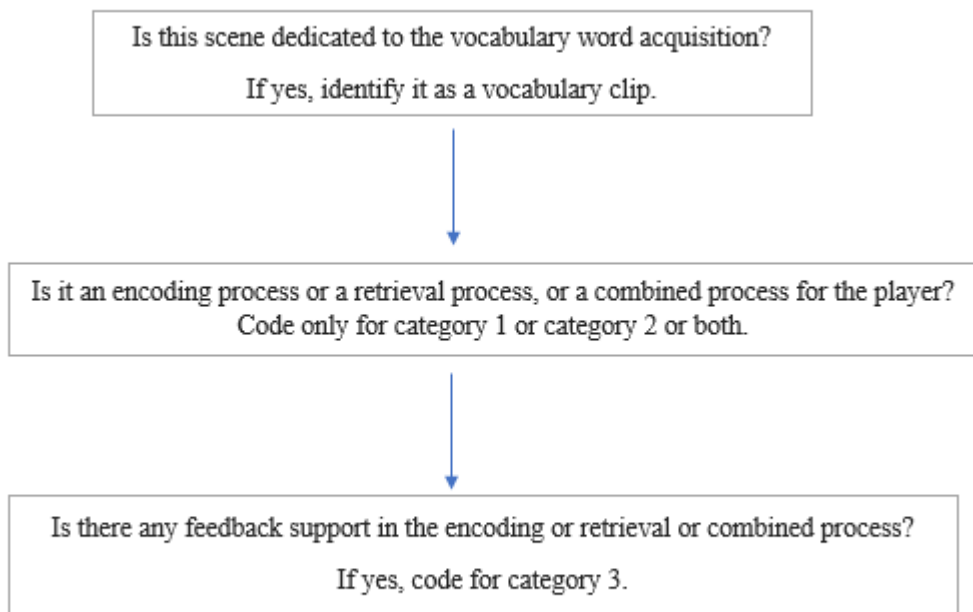


Figure 6. Flow Chart to Identify Vocabulary Clips and Digital Game-Based Pedagogical Supports.

Vocabulary Clips

Based on the definition proposed by Wong and Neuman (2019), a vocabulary clip referred to a learning experience in which an English word was explicitly taught or introduced through verbal or nonverbal support. A scene is “a sequence of continuous action” in which vocabulary was represented or taught (Neuman et al., 2019). By locating the moment when a verbal or non-verbal presentation of a word first appeared on screen as a learning opportunity, my collaborator and I identified the beginning a vocabulary clip (Paivio, 2008; Wong & Neuman, 2019). At the end of the scene, we then concluded the vocabulary clip.

In my case, vocabulary clips were embedded within the game structure flow. After playing each game for more than two hours, I found that vocabulary clips were not challenging to identify because the play structure flow in these educational digital games is usually repeated from one play level to another, and even from one word to another. For example, the first level or unit has the same flow design as the second or subsequent levels, and the difference is just in the educational content. Across all identified vocabulary digital games, the pedagogical supports in the first level or unit are the same as in the following ones since the structural flow for each level or unit is the same, without exception, for these seven digital games. Therefore, for the purpose of analyzing pedagogical supports, I only identified the vocabulary clips at the first level of each digital game. Further, within one level, from word to word, the learning opportunities are similar since the game flow is the same for each word. In each case, even though words

vary, the vocabulary scene mechanism is the same, and I treated them as one vocabulary clip. In total, I identified 33 different vocabulary clips across seven digital games.

Coding for Pedagogical Supports

Following the same procedure in producing a codebook for screen media in the study of Wong and Neuman (2019), I developed a codebook for this study to classify and analyze pedagogical supports that scaffolds vocabulary acquisition on digital games. Similar to screen media, on digital games, pedagogical supports or strategies covered verbal and nonverbal cues which were provided as sources of comprehensive input (Paivio, 2008; Wong & Neuman, 2019). To produce the codebook, I played the games slowly and analyzed specifically on every vocabulary clip identified to form an initial set of digital game pedagogical supports for EFL vocabulary learning. According to Neuman et al. (2018), screen-based pedagogical supports referred to cues on screen that delivered pedagogical intent and elicited students' attention. Similarly, digital game-based pedagogical supports can be defined as cues on screen that engage players' attention for pedagogical intent. I identified a total of 25 pedagogical supports. Then discussion with another researcher was conducted to finalize the codebook of pedagogical supports. Finally, I reduced 25 pedagogical supports to 18 supports informed by literature across English vocabulary acquisition (Table 3). Two researchers used these 18 pedagogical strategies as the codebook to code the 33 vocabulary clips.

The three categories of digital game-based pedagogical supports are presented in Table 3: (a) *encoding supports*, (b) *retrieval supports*, and (c) *player attention and feedback* (Table 3). The first category, *encoding supports*, consisted of eight pedagogical

supports. Encoding strategies are used to “introduce new words and begin the memory process” (Sprengrer, 2017, p. 5). All supports in this category served to facilitate the main input process of the word from definition, pronunciation, synonym, and antonym. The second category, *retrieval supports*, is mainly related to vocabulary output, and is used to evaluate students in various ways to help them retain words in their long-term memory (Gallagher & Anderson, 2016; Vasu & Dhanavel, 2015). It includes seven pedagogical supports like word formation, hint, sentence cloze, and word list. The final category, *player attention and feedback*, is used in gaining players’ attention on the screen and providing feedback (Vasu & Dhanavel, 2015; Wong & Neuman, 2019). It includes three pedagogical supports, and they are visual effect, sound effects and humor.

Table 3

Details of Each Vocabulary Pedagogical Support in the Codebook

Details	Citations
1. Encoding Supports	
A. L1 Definition: Use first language to define the word.	Collins, 2010; Wong & Neuman, 2019
B. English Definition: Use target language to define the word.	Carlo et al., 2004; Wong & Neuman, 2019
C. Examples: Give example phrases or sentences to demonstrate the use of the word.	Collins, 2010; Wong & Neuman, 2019
D. Image: Use a visual image of the word to represent its meaning.	Takanishi & Le Menestrel, 2017; Karlsson, 2018
E. Pronunciation Scaffolding: Use native-speaking pronunciation to learn word.	Lawson & Hogben, 1996; Lau, 2018
F. Synonym and Antonym: Connect the word to its synonym or antonym.	Vasu & Dhanavel, 2015; Karlsson, 2018
G. Note-taking: Players can take notes about the word.	Yudintseva, 2015; Mokhtar, Rawian, Yahaya, Abdullah, & Mohamed, 2017

Table 3 Continued

Details	Citations
H. Physical Action: Use physical action to study the word meaning.	Catalan, 2003; Vasu & Dhanavel, 2015
2. Retrieval Supports	
A. Say It Aloud: Speak the word orally.	Vasu & Dhanavel, 2015
B. Word Formation: Retrieve the spelling or word parts.	Lawson & Hogben, 1996; Lau, 2018
C. Translation: Use translation of word, phrase or sentence to retrieve the target word.	Lawson & Hogben, 1996
D. Hint: Provide hint to player to answer.	Brown & Perry, 1991
E. Sentence Cloze: Retrieve the word in a sentence cloze question.	Lau, 2018; Laufer & Osimo, 1991
F. Word Lists: Form a word list with retrieval-related information like error word list.	Lawson & Hogben, 1996; Yudintseva, 2015
G. Spacing: Arrange spaced-retrieval practice.	Vasu & Dhanavel, 2015; Bytheway, 2015
3. Player Attention and Feedback	
A. Visual Effect: Use visual change on screen to get player's attention to give feedback.	Silverman & Hines, 2009; Wong & Neuman, 2019
B. Sound Effect: Use sound effect to get player's attention to give feedback.	Verhallen et al., 2006; Wong & Neuman, 2019
C. Humor: Use humor to get players' attention to give emotional feedback.	Neuman et al., 2019

As shown in Figure 7, the vocabulary clip was coded as an encoding process first. Then, in encoding supports, L1 definition, examples, image, pronunciation scaffolding, and physical action were identified. In Figure 8, the vocabulary clip was coded as retrieval process first. Then in retrieval supports, translation and hint were identified. The game in which Figure 8 comes from also includes feedback process, so pedagogical supports of visual effect and sound effect were identified in player attention and feedback.



Figure 7. Example 1 of Pedagogical Supports.



Figure 8. Example 2 of Pedagogical Supports.

Reliability

Two researchers worked collaboratively to code the vocabulary clips based on the questions in the flowchart above. These two researchers are proficient both in English and Chinese and specialize in second language acquisition discipline. For ascertaining vocabulary clips, the interrater reliability was established at 0.894 and areas of disagreement were flagged and settled later through further discussion. The pedagogical supports, which were the second level of coding, yielded an interrater reliability of 0.89 between two researchers.

Quantitative Analyses

In this content analysis, I first investigated the frequency of each pedagogical support in each of the educational digital games. I used percentage to present the prevalence of characteristics of those pedagogical supports across domains. Next, I examined those pedagogical supports across digital games to gain the characteristics of usage based on their frequency using Excel software.

Results

The seven digital games identified are all for informal learning instead of serving for classroom supplementary teaching tools, which means English students can only utilize these games in times outside of school. The results of the research questions are shown below.

What Pedagogical Supports Are Reflected in Digital Games Used by Chinese Secondary EFL Learners to Acquire Vocabulary?

As briefly described in the methods section, 3 domains and 18 digital game pedagogical supports were elicited in the context of Chinese students at the secondary level. In the domain of *encoding supports*, there are eight pedagogical supports. The first one is first language (L1) definition in which L1 is used to define the English word. In this context, the first language is Chinese. For example, when the target word “good” is introduced, its Chinese meaning “好的” is shown on the screen to players. The second one is *English definition* which means the target language (in this case is English) is used to help students learn the word. The third one is *examples*. In this pedagogical support, phrases or sentences with the target word are given to students as an example to help understand the usage of the word. The fourth support is *image*. A pictorial image on the screen helps the player to understand the meaning of the word. The fifth support is *pronunciation scaffolding*. Native English pronunciation audio or video is provided for students to learn word. The sixth support is *synonym and antonym*. Synonyms or antonyms are provided to students to further understand and contextualize the target word. The seventh pedagogical support is *note-taking*. The vocabulary learning scene on the game allows students to input notes of the target word to further understand the word. The last pedagogical support in this domain is *physical action*. As an example, in the game, a video encompassing gesture language of the target word is provided for students to learn.

The second category is *retrieval supports* and includes seven pedagogical supports. The first one is *say it aloud*. In the recall scene, students are required to speak the word orally to get scores. For example, the Chinese meaning of a word is given on the screen, and the player is asked to answer by recording the word aloud. Voice recognition is used to evaluate learner's accuracy. The second support is *word formation*. In this pedagogical support, students are required to recall the spelling of the word or parts of the word. The third one is *translation*. In the retrieval scene, students need to translate the word from L1 to L2 or from L2 to L1 correctly in order to get scores. The fourth support is *hint*. In recall exercise, if students do not know the answer, they can choose to get hint. The fifth one is *sentence cloze*. The target word is removed in a sentence and students need to choose the correct answer to fill the blank. The sixth pedagogical support is *word lists*. In a retrieval scene, the system will automatically organize words for students to form error word lists or known word lists based on the retrieval outcome. The seventh one is *spacing*. Spaced-retrieval practice is arranged in game system.

In the domain of *player attention and feedback*, there are three pedagogical supports. The first one is *visual effect*. Visual image or visual change on the screen is given to gain players' attention and make them engage with the feedback. For example, after a player answers questions correctly, the two parts of the word disappear to indicate the correction. The second one is *sound effect*. In feedback, sound is given. For example, if a player answers correctly, praise like "Great job!" will sound. The last pedagogical support in this domain is humor. Humor is used for giving emotional feedback. For

example, after finishing one level, a funny Chinese sentence on the screen will be shown to reflect the feedback.

What Are the Characteristics of the Usage of Pedagogical Supports?

It is clear from Table 4 that the distribution of frequency across the three domains is different. Most coded pedagogical supports cluster on the domain of *retrieval supports*. These supports account for 45% of all supports. The following domain is *encoding supports* which makes up 34% of supports. The third domain, *player attention and feedback*, only has 21% of the coded pedagogical supports. In the reviewed Chinese English vocabulary digital games, secondary EFL learners are more likely to learn in the retrieval process instead of encoding process, and least through the feedback aspect.

In the first domain of *encoding supports*, *L1 definition* and *pronunciation scaffolding* are more frequently adopted than other pedagogical supports. In the *retrieval supports*, *word formation* and *translation* account for the highest percent compared to other five supports. In the domain of *player attention and feedback*, *visual effect* is the most used pedagogical support.

Table 4*Frequency and Percent of Pedagogical Supports*

	Frequency	Percent
1. Encoding Supports	29	34
A. L1 Definition	9	11
B. English Definition	1	1
C. Examples	4	5
D. Image	3	4
E. Pronunciation Scaffolding	9	11
F. Synonym and Antonym	1	1
G. Note-taking	1	1
H. Physical Action	1	1
2. Retrieval Supports	38	45
A. Say It Aloud	2	2
B. Word Formation	9	11
D. Translation	9	11
E. Hint	8	9
F. Sentence Cloze	1	1
G. Word Lists	6	7
H. Spacing	3	4
3. Player Attention and Feedback	18	21
A. Visual Effect	13	15
B. Sound Effect	3	4
C. Humor	2	2
Total	85	100

In terms of the pedagogical support distribution across those seven digital games, as indicated in Figure 9, game 1 was designed with the most coded pedagogical supports and these supports provide mostly for the encoding process, even though there are also some supports for the other two domains. However, in game 4, most supports are used for the retrieval practice instead of the encoding process. In game 2, the encoding process and retrieval process are equally employed through pedagogical supports.

Compared to other five games, game 2 is the most balanced one in terms of pedagogical supports across three domains. Game 5 and game 6 are somewhat similar in the three domains' distribution. More retrieval supports are provided than encoding supports, and the supports for player attention and feedback is the least represented across all games. In game 3 and game 7, little pedagogical support is provided and there is no encoding process for acquiring English words.

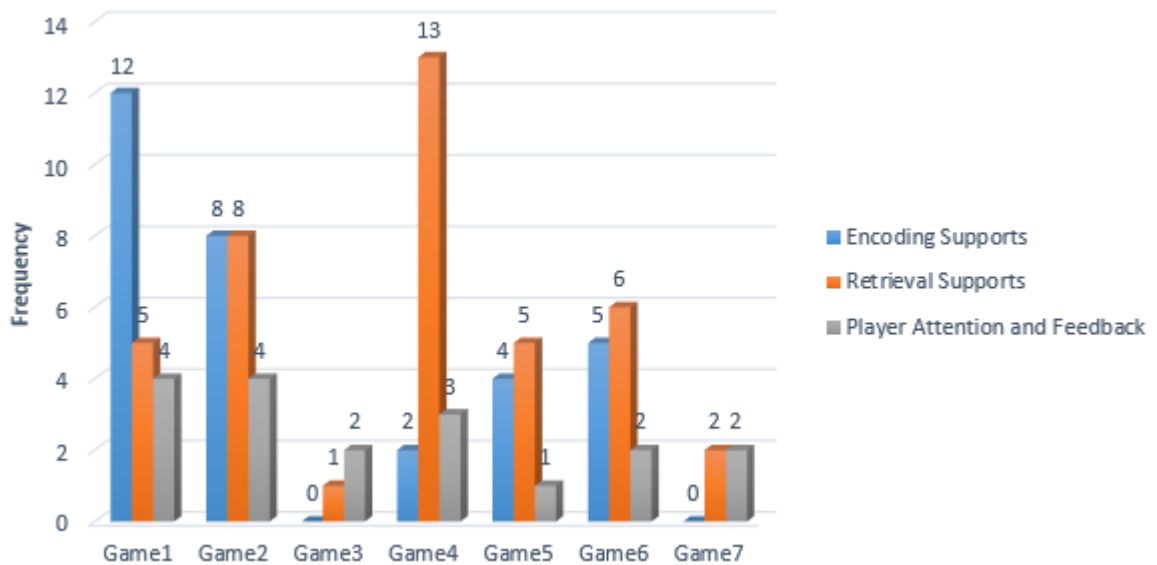


Figure 9. Comparison of Pedagogical Support by Games.

Discussion

In this study, I conducted a content analysis of extant digital games that focused on secondary EFL learners in China. I chose digital games that were designed to facilitate English vocabulary development and acquisition.

First, I found that there was a paucity of diversity in opportunities for players to acquire vocabulary in these digital games even though they were marked as fun and effective games in product advertisements. For long-term vocabulary acquisition, comprehensive input is important based on the input hypothesis (Krashen, 1982), but the lack of diversity of the game design leads to a failure in facilitating comprehensive input. In particular, the overall frequency of player attention and feedback is very low, which indicates that the design of the feedback flow is monolithic and lacks variety. It may cause students to have negative emotions like boredom while playing the digital game, and they will not enjoy a flow state that reinforces strong intrinsic motivation to continue using the game (Csikszentmihalyi, 1990). In doing this work, I question whether these games show greater promise for students to develop vocabulary than traditional ways like using vocabulary books. In addition, those games were not designed to allow players to interact with each other in learning and playing. However, peer interaction is critical for a game because students can obtain experience in cooperation and communication that contribute to their self-regulation and active learning in playing games (Burguillo, 2010; Jong et al., 2013).

Second, acquiring vocabulary is a long-term task when the goal is a complete acquisition process. Both encoding and retrieval process should be imbedded in games. However, among all these games, there is a failure to provide balanced pedagogical supports across different processes. Some of them do not even include an encoding process which is the first step for the successful acquisition of vocabulary (Sprenger,

2017). None of these games provide diverse or sufficient learning opportunities with balanced pedagogical supports across learning phases.

Third, some pedagogical supports such as L1 definition, pronunciation scaffolding, word formation, translation, and visual effect in feedback are better reflected in some games than others in this study. The most used pedagogical supports, like Chinese definition, word formation, and translation, can be located easily in traditional non-digital language learning materials like vocabulary books (Collins, 2010; Lau, 2018; Lawson & Hogben, 1996). Therefore, educators must question what additional value games add to learning effectiveness. The digital games reviewed in this study did not maximize their full potential to facilitate EFL vocabulary learning when considering pedagogical approaches.

Overall, findings from this study further our understanding of how educational digital games support vocabulary learning in EFL. The limitation of this study is that I only focused on the Chinese context and my sample of educational digital games is small. It is possible that diverse and effective pedagogical approaches are represented better in other EFL countries' digital games (Yudintseva, 2015). More similar research should be conducted in the future to further investigate this topic and confirm whether the poor educational quality of EFL vocabulary digital games is specific to region. In terms of practical implications, I suggested that game designers should pay more attention on the educational design, specifically on enlarging the diversity of pedagogical supports (Bytheway, 2015).

Conclusions

Based on the content analysis of digital games in English vocabulary learning, a limited number of learning opportunities are provided for EFLs in China. Additionally, there is a lack of diversity in pedagogical supports used to meet the needs of secondary school EFLs in China. Despite an existing understanding and knowledge on effective vocabulary instruction (e.g., using comprehensive input and spaced repetition), there are few instances of such instruction techniques found in these digital games. Therefore, though there is a potential for educational digital games to engage learners with high quality learning, the findings of my study suggest that the existing digital games may not be providing secondary students with high-quality vocabulary learning experience needed to prepare them for their next level of study.

CHAPTER IV

TEACHER PERCEPTIONS ON EFFECTIVE ELEMENTS OF VOCABULARY DIGITAL GAMES FOR LEARNING ENGLISH AS A FOREIGN LANGUAGE (EFL)

Introduction

In foreign language learning, due to the impact of diverse acoustic and optical stimuli, digital games have gained popularity among learners (Dickey, 2011; Shih et al., 2010). However, a significant mismatch between what game developers create and what learners need exists as games often lack opportunities for vocabulary acquisition (Vaala et al., 2015). As more games hit the market, researchers have begun to question what elements are most effective in a high quality educational digital game. In EFL vocabulary acquisition, researchers have examined the effects of digital games (Aghlara & Tamjid, 2011; Chen, Liu, & Huang, 2019; Hwang & Wang, 2016; Letchumanan, Tan, Paramasivam, Sabariah, & Muthusamy, 2015; Wu, 2018). Based on the results of these studies, researchers found that digital games were an effective tool to assist English vocabulary learning, but none of these authors discussed the effective elements for the digital games. The purpose of this study is to investigate the effective elements for EFL vocabulary digital games from the perspective of English teachers. Features of digital games are discussed in the following literature review.

Literature Review

In this section, I reviewed the literature related to EFL vocabulary digital games that identified elements which could be beneficial for EFL learners across different grade levels.

For elementary EFL learners, automatic speech recognition technology is an effective element for vocabulary learning in digital games. According to Young and Wang (2014), a digital game with automatic speech recognition technologies provides better effectiveness in English vocabulary learning than non-game instruction. In their researched game, players were asked to choose and pronounce the vocabulary words correctly from candidate answers to pass level barriers. Chen and Lee (2018) compared the effects of two educational digital games—an application-driven game and a quiz gam—among elementary EFL learners in Taiwan. Their work showed that the application-driven game contributed to enhanced learning-regulation and a better flow experience. The features that might be effective elements in the application-driven game were the inclusion of scenarios, response tracking, data visualization, color-coded warning, theme-based tasks, and the provision of learning suggestions.

For secondary EFL learners, the effectiveness of a mobile app game for vocabulary learning was evaluated by Hao at al. (2019). The findings indicated that the use of the app game improved participants' vocabulary learning and enhanced their confidence. The features of the game included textbook-based and level-based words, task-oriented puzzle solving, authentic situations, a get-clue function, and a pronunciation function. Ebrahimzadeh (2017) investigated the effects of a commercial

video game integrated in classrooms for high school students. The game players outperformed the students in traditional pencil-and-paper instruction in vocabulary acquisition. The game used in Ebrahimzadeh's study was Warcraft III: The Frozen Throne. The possible effective elements in this game included word noticing, word repetition, word generative use, and the multiplayer nature of the game.

For university EFL learners, Yip and Kwan (2006) conducted a quasi-experimental study on the effects of website games. The researchers found that the experimental group participating in digital game playing outperformed a control group with traditional class instruction. Based on the results of Yan and Kwan's description, the possible effective elements elicited from digital games included word lists categorized as related groups, repetition of words, simplicity, continuous change of game, and supplementary learning material. Ranalli (2008) conducted a classroom-based investigation to see whether the simulation game named SIMs generated pedagogical effectiveness. The possible effective elements which contributed to participants' vocabulary learning were the simulation nature of the game and the supplementary materials designed and provided to the students with the game. Simulation games provide realistic animation, impressive interactivity, and complex scenarios which contributes to a virtually and cognitively engaging playing environments within a diverse learning context (Ranalli, 2008). In addition, the supplementary materials, which served as a companion to the game, included cultural notes, vocabulary quizzes, and information and instructions for daily play of the game (Ranalli, 2008). Vahdat and Behbahani (2013) also investigated the effects of video games for university EFL

vocabulary acquisition. The participants in the experimental group performed better in a TOEFL test compared to participants who learn vocabulary through traditional classes. According to the game description provided in the study, the possible effective elements that lead to effectiveness included the presentation, practice (repetition) and production in every learning task and the ample situations provided in the game. In a study by Wu & Huang (2017) on a different English vocabulary game, they found that university EFL learners who played the game exhibited higher learning effectiveness in vocabulary learning compared to other students. The possible effective elements of the game included textbook content, provision of a word difficulty ratio, and generation of a personal learning portfolio generated.

Chen, Chen, and Dai (2018) examined the effects of a narrative-based contextual digital game system named PlanetAdventure for college EFL's vocabulary learning. The results revealed that the game system enhanced participants' learning achievement. The effective element in the game was the narrative environment which made players cooperate, play, strategize, and engage with learning resources, objects and other players through cognitive and motivational facilitation. The narrative framework included three significant dimensions—storyline design, character design, and question design. Chen et al. (2019) compared the effects of a game-related vocabulary phone program and non-game-related program among university EFL students. The findings indicated that students performed better by using the digital game in English vocabulary acquisition compared to students who used non-game program. The effective element addressed by

the authors was the “gamified assessment with ranking among learning peers” (Chen et al., 2019).

Even though diverse effective elements were elicited from the studies above, it was difficult to summarize or synthesize their findings because the purpose of those studies was to investigate whether digital game was effective to EFL learners’ vocabulary acquisition rather than to examine what exact element(s) contributed to efficacy in the reviewed games. Therefore, the previous studies did not provide a useful inventory of what elements were included in the digital game that led to effective language outcomes. For example, in the study conducted among middle school EFL by Hao et al. (2019), the digital game researched was reported to be an effective educational tool. However, the authors did not elaborate on the effective elements, which made it difficult to ascertain from their study what effective elements could be replicated in other settings. In addition, I did not find a specific empirical study that focused on investigating or elaborating on effective elements of education digital games, nor was there a mention of the specific area of EFL vocabulary learning.

Therefore, effective elements need to be grounded with theoretical and empirical evidence, and there is an urgent need for research which explores the effective elements of education digital games. Digital games have brought a new dimension to education and have been introduced to teachers and students as a novel strategy to facilitate teaching (Ince & Demirbilek, 2013). There is a close relationship between teachers’ instructional perceptions and their usage of technology in classrooms (Niederhauser & Stoddart, 2001). Considering the usage of digital games in classrooms, teachers’

perceptions are critical for educational digital game design. The first step in incorporating these perceptions should be to understand, from the teachers' perspective, what effective elements they believe contribute to successful outcomes. Then, these elements can be put into practice to be further tested. To this goal, I asked teachers what elements were most effective for EFL vocabulary learning.

Research Question

In this study, I focus on EFL teachers' perceptions related to the effective elements which contribute to a high-quality English vocabulary digital game. The following overarching question guides this study:

What are teacher-perceived key elements in an effective English vocabulary digital game for secondary EFL learners?

Methodology

Research Setting

The research was conducted in the contexts of Chinese middle and high schools. There are mainly two types of high schools in China—public and private schools. Students with good academic achievement are usually at public high schools. Generally speaking, only when students fail the entrance exam to public high school, do they choose to enter the private school to further their study as the requirements in private schools are lower than those of public schools. Besides public and private schools, attending afterschool for middle and high school students is popular since they elect to receive extra tutoring in preparation for their entrance exams.

Participants

I used convenience sampling to recruit ten EFL teachers in China who agreed to participate in this study. Among these ten teachers, five were middle school English teachers, and five were high school English teachers. All of them were recruited from the east coast area of China. All of them are female teachers. Even though the average years of teaching among the participants is 15 years, 80% of these teachers have been an English teacher for less than 9 years, which indicates that most of the teachers were born after 1980 and are more adaptive to technology innovation compared to older generations. In addition, among these participants, there were two experienced English teachers whose teaching length were above 24 years. Table 5 shows the participants, their years of experience, and their school type.

Table 5

Participant Information

Teacher	Teaching Experience	School Type
A	7	After-school/middle school
B	8	Public/middle school
C	8	Public/middle school
D	8	Public/middle school
E	8	Public/middle school
F	24	Private/high school
G	8	Private/high school
H	7	Private/high school
I	4	Public/high school
K	35	Public/high school

Research Instrument

Semi-structured interviews were conducted with the participating EFL teachers. Since only ten teachers were interviewed, it was best to adopt semi-structured interviews in my study. This type of interview offers more useful data if the sample size is relatively small and a thematic analysis of the qualitative data is performed (Alvarez & Urla, 2002; Pathak & Intrat, 2016). Compared to a structured interview in which a rigorous set of questions prepared regulate the interview, a semi-structured interview is more flexible and allows new views to form during the interview based on interviewees' responses (Arksey & Knight, 1999). A semi-structured interviewing usually starts with more general questions (Arksey & Knight, 1999), and relevant themes develop in a "following conversation" throughout the interview (Choak, 2012). The questions created for the interview were based on the literature review in this field. The question and topic list prepared to guide the interview and used to elicit EFL teachers' thoughts are included below.

1. From your experience or observations, what are the challenges your students face in English vocabulary acquisition?
2. Do you think an online vocabulary digital game with good design can solve these challenges?
3. Can you recommend any digital game that your students might like to play, or do you know any popular digital game that your students play?
4. What are the key elements for an effective English vocabulary digital game for your students? (Feel free to answer more related to the aspects of vocabulary

content, education features, content flow, functions, art style, interactivity, play time, play platform, etc.)

Question one to three were used to elicit teachers' thoughts and question four corresponded to the research question of this current study. Two researchers in the field of bilingual education agreed on the appropriateness of the question list to elicit thoughtful responses.

Data Collection

Online interviews via Skype were used with prepared general interview questions. For each participant, a maximum of 45 minutes was allotted for the interview. During each interview, recording software was opened to record the process. Because the semi-structured interview is more flexible and can accommodate more diverse kinds of questions, several techniques were adopted during the interviews. At the beginning of the interview, the interviewer spent time building rapport with the English teachers by sharing common ground and experiences. During the interview, thought-provoking questions were asked to help the interviewee think deeply or thoroughly by using my prepared question list and a mix of adapted questions to each individual context. The interviewer and interviewees were English-Chinese bilinguals. English and Chinese were used interchangeably based on different situation. Participants were allowed to answer in Chinese or English as they wished.

Strategies Adopted to Ensure Data Quality and Integrity

Based on the Lincoln and Guba's (1985) criteria, trustworthiness can be established through credibility, dependability, transferability, and confirmability.

Credibility was improved through teachers' voluntary participation and rapport building which led to open and honest answers. Additionally, participants were given a copy of their answers of the interview to allow them to request changes. Dependability was attained through a detailed and thorough description of the research. Transferability of the study was established by providing detailed information about the methods and the teacher interview response content to make sure that readers had enough information to understand the research and connect with their own background and experiences. Confirmability was enhanced through a cross-checked interpretation by two Chinese-English bilingual researchers of the results. Participants volunteered to participate in the study, and they were free to withdraw at any time. They all provided informed consent. In addition, confidentiality and anonymity were ensured through file encryption and use of pseudonyms.

Data Analysis

After the online interview, I transcribed the recording into text. This qualitative data was then analyzed and coded by me and two Chinese-English bilingual researchers using content and thematic analysis. Thematic analysis is used for identifying themes and patterns within qualitative data (Evans & Lewis, 2018). A process of reading word by word, re-reading, analyzing, and interpreting of the data was conducted for the transcripts. A theme should capture "something important about the data" related to the overarching research question of study (Evans & Lewis, 2018).

Two researchers made notes based on first impressions of initial analysis. Next, themes from the text emerged by summarizing the key thoughts of each response. The

average inter-rater reliability across all coded texts was 0.88 (Cohen’s Kappa) between the two researchers. All disagreements were discussed between the researchers until they were resolved. Practically, data analysis relied on the reflexivity of the researcher, which required a critical attitude towards interpretation and summarization (Brewer, 2000).

Results

After the analysis of ten teachers’ responses, three themes with eleven elements (Table 6) were identified to effectively answer the research question of what teacher-perceived key elements contributed to the efficacy of an English vocabulary digital game for secondary EFL learners are.

Table 6

Teacher-Perceived Elements

Theme	Element	No. of Teachers Mention it
Content	Daily life application scenario	5
	Proper amount of learning content for each level	4
	Textbook related content	2
	Enough practice	2
	Theme-based vocabulary	1
Interactivity	Diverse functions	6
	Play time control	4
	Popular platform	2
	Simple and smooth flow	1
Interestingness	Cartoon art style	3
	Vocabulary visuals	1

Theme 1: Content

In the theme of content, there were five elements: inclusion of a daily life application scenario, proper amount of learning content for each level, textbook-related content, enough practice, and theme-based vocabulary.

Among ten teachers, five teachers regarded the inclusion of a daily life application scenario as a key element in an effective English vocabulary digital game for secondary EFL learners. One teacher said, “it is good for students to learn how to use the words in a real situation.” Another four teachers also emphasized that the application scenario should be linked to students’ daily life, which is shown in the following quotes:

“The game should present a certain application scenario of words and also fit secondary students’ life features.”

“The words should be learned in a real application scenario and also cling to students’ daily life, which is more acceptable to students and also makes them more motivated to learn.”

“Another point is the scenarios should be designed based on students’ life.”

Four out of ten teachers believed that proper amount of learning is one key element in in an effective English vocabulary digital game for secondary EFL learners. Teachers’ responses to this theme included the following quotes: “in terms of vocabulary memorization, it should be operated in units or batches and amount should be proper”; “I think it’s easier for students to build the whole vocabulary system if students can learn words from small unit to large unit gradually, like from single word, phrase, sentence and finally to passage”; “difficulty degree or amount of learning of the task should be

designed properly”; and “for the content design, I think it should be gradient-like and the amount should be adjusted based on different grades”.

Two teachers emphasized that it would be better if the vocabulary game was designed based on the English textbook. One teacher mentioned that “the learning content in the game should have overlapping parts with the English textbook content so that the learning task will not be so difficult in the game.”

Enough vocabulary practice was emphasized as an effective element in a digital game for long-term vocabulary learning by two teachers. One teacher stated that in an effective vocabulary game, vocabulary should be learned based on themes by students.

Theme 2: Interactivity

In the theme of interactivity, there were four elements: diverse functions, play time control, popular platform, and simple and smooth flow.

Six of ten teachers believed that diverse function is one key element in an effective English vocabulary digital game for secondary EFL learners. Besides the function of remembering English vocabulary, they held the view that “function should be diverse because it can attract students continuously and also help students remember words from multiple ways,” and “diverse interactivity makes students remember words easier”. Five teachers even gave their design ideas about what the diverse functions should be :

“As for the functions, if there are some barrier and pass design, it will be better.”

“If there are one-to-one player fighting or group-to-group player fighting function, it will be amazing.”

“Students can also make friends through the platform.”

“In the game, students should be allowed to show off their achievement on game interactivity. It will be more effective if there are functions like answering questions within limited time and competing with multiple people simultaneously online.”

“It should have barrier and pass interactivity. For example, students should translate English words to Chinese meaning or Chinese meaning to English words correctly in order to pass to the next level. The players’ performance should be recorded by the game system. For instance, if the player learned five words today, it should be recorded so that he can perceive his progress quantitatively.”

Four of ten teachers held the view that play time control is a key element in an effective English vocabulary digital game for secondary EFL learners. One teacher thought that electronic device was harmful to teenagers’ eyesight and play time should be controlled by the game system. Two teachers believed that the play time should be controlled within 30 minutes. One teacher suggested that the player time should be around one hour.

Two out of ten teachers emphasized that the popularity of the platform for a vocabulary digital game can be a key element in its effectiveness for secondary EFL learners. They both believed that in China, the popular WeChat platform which is a Chinese multi-purpose social media, messaging, and mobile payment application is the correct platform for their students to play digital games. One teacher believed that simple and smooth flow would be an effective element for an English vocabulary digital game.

Theme 3: Interestingness

In the theme of interestingness, there were two elements: cartoon art style and vocabulary visuals. Teachers emphasized the general interestingness of the game. They suggested that “the game should have strong interestingness,” “it should grasp secondary students’ interestingness,” and “it must be interesting during learning vocabulary.”

Three out of ten teachers mentioned that a cartoon art style could be an effective element in an English vocabulary digital game for secondary EFL learners. They thought that the cartoon style was the correct game style that fit the secondary students. Vocabulary visuals were mentioned as another effective element by one teacher, and she held the view that “if one new English word could be presented in pictures, it would be helpful for students to learn it”.

Discussion

In this study, I examined teachers’ perceptions of an effective English vocabulary digital game for secondary EFL learners in the context of China. I used thematic analysis and explored key elements of an effective English vocabulary digital game. In this section, I discuss the findings in terms of the teacher-perceived key elements.

For the theme of content, half of the English teachers held the view that for a successful vocabulary digital game, the design of connecting students’ daily life to an application scenario was very critical. This idea has been supported by the work of Hao et al. (2019). Based on their study, authentic situations can be an effective element for a successful vocabulary digital game. Forty percent of teachers interviewed regarded a proper amount of learning as a key element of an effective vocabulary digital games.

Based on flow theory (Csikszentmihalyi, 1990), the balance and harmony between competence and targeted tasks is essential for learners to create a joyful learning experience which contributes to high intrinsic learning motivation. In educational digital games, a proper amount of learning should be identified to keep students in that learning flow experience. Twenty percent of the teachers mentioned that textbook-related content could be a key element for a successful English vocabulary digital game. Similarly, Hao et al. (2019) suggested that textbook-based words could be an effective element which contributes to the effectiveness of English vocabulary digital game. In addition, participants suggested that what platform the game is imbedded in was an important element.

In a study by Vahdat and Behbahani (2013), repetitive and sufficient practice was suggested as a possible element that predicted the effectiveness of the vocabulary digital game. Based on the study of Chen et al. (2020), theme-based English learning is effective and helpful for EFL language acquisition.

In the theme of interactivity, results obtained from this study indicate that diverse functions are an important element for an effective English vocabulary digital game for EFL learning. This result corroborated Krashen's (1982) input hypothesis of language acquisition which states that comprehensive input should be applied in the process of learning. Diverse functions in a digital game can contribute to the realization of comprehensive input. From the study of Chen et al. (2018), an effective element for a vocabulary digital game can be diverse functions which asks the player to cooperate, play, strategize, and engage through diverse cognitive and motivational steps. Teenagers

can be so addicted to digital games that the Chinese government instituted an “online game curfew” to regulate playtime (Cyberspace Administration of China, 2016).

Additionally, playing video games on electronic devices was cited by participants as potentially harmful to students’ eyesight. For these reasons, play time control could be considered a key element in the eyes of many teachers. In the participants’ opinions, which platform the game was imbedded in was also an important element. Putting a game on a popular platform like WeChat, mentioned by teachers, could contribute to easier access to the game and more motivation to play with friends. Finally, simple and smooth flow was mentioned by one teacher as key element. The study of Yip and Kwan (2006) indicated that simplicity of game flow could be an effective element leading to the success of vocabulary digital game for EFL.

In the theme of interestingness, 30% of the teachers emphasized cartoon art style as a key element for an effective English vocabulary digital game. Flow theory is the perception that when an individual is exposed to a flow state in participating an activity, diverse positive emotions arouse (Csikszentmihalyi, 1990). In fact, in the process of participating the activity, different positive emotions (e.g. ease, pleasure, peace) are produced so that the people have desire to experience it, which leads to strong inner motivation. Cartoon art styles produce a positive emotion during learning and maintain students in the flow state. Cartoon art style is more customized for secondary EFL, and according to teachers, students like the cartoon style more than other styles. Another element related to interestingness is vocabulary visuals. Participants suggested that

visuals are an effective medium for facilitating vocabulary acquisition (Ramadanty, 2019).

The eleven effective elements can be used as collective evaluation rubrics to analyze the effectiveness of one English vocabulary digital game for teachers and parents. Educators and digital game designers can also use these eleven elements as a reference list to check whether an English vocabulary digital game may be effective or what elements should be incorporated when designing a digital game.

In regards to the limitations of this study, another researcher with different lived experience may have coded the transcripts differently. However, as qualitative analysis is subjective, my integrated bias is acceptable. In the present study, two researchers interpreted and summarized together to increase the validity of the results. In addition, I only concentrated on the Chinese context and sampled participants based on convenience. In the future, similar research can be conducted to recruit EFL teacher participants in other countries. Also, in order to ascertain the effective elements, quantitative studies are needed to further explore this topic. For educational game design, even though the element named diverse functions is the one that most frequently mentioned by teachers, all eleven elements should be considered as important to an effective English vocabulary digital game.

Conclusion

In this qualitative study, I investigated ten EFL teachers' perceptions of key elements in an effective vocabulary digital game. Three themes with eleven key elements were identified that can be used to determine the effectiveness of an English

vocabulary digital game. The elements were diverse functions, daily life application scenario, proper amount of learning content for each level, play time control, cartoon art style, textbook related content, popular platform, enough practice, simple and smooth flow, vocabulary visuals, and theme-based vocabulary based on frequency order. All these elements identified are reasonable and supported by existing theories or studies. In particular, the element of diverse functions probably should receive the most attention by educators and educational digital game designers.

CHAPTER V

CONCLUSION

In this dissertation, I conducted three studies related to the field of EFL/ESL vocabulary acquisition through digital games, including a scoping review, a content analysis, and a qualitative study. In this chapter, I present the findings of these studies to respond to the three research questions proposed in Chapter One.

What Does the Existing Literature Say about the Effectiveness of English Vocabulary Digital Games for EFL/ESL?

The scoping review in Chapter Two revealed that studies investigating the effectiveness of English vocabulary digital games is severely limited, and only 29 studies met my search criteria to be included in the review. By analyzing these empirical studies, I found that in the majority of the studies (26), researchers achieved consensus that digital game-based learning is an effective tool to increase EFL/ESL vocabulary acquisition across all grade levels of EFL/ESL learners from preschool level to adult students.

However, a discrepancy exists between my participants' experiences and the 26 studies reviewed. According to the findings of Ghaemi and Ebrahimi (2015), non-digital game group learners performed better than learners who used digital games for vocabulary achievement. Similarly, Young and Wang (2014) suggested that students in digital game-based groups were less successful in vocabulary outcomes in comparison with students who played digital games. Also, Lucht and Heidig (2013) conducted a

study which indicated that an integrated digital game had not enhanced students' vocabulary acquisition even though better attitudes towards the game were reported. Coincidentally, participants were all elementary students in these three studies, which established a disparity of the effectiveness of English vocabulary digital games for elementary school students. Clearly, the effectiveness of digital games on vocabulary learning still needs to be investigated particularly among elementary EFL /ESL learners.

In addition, there was a discrepancy related to effectiveness of digital games on outcomes across gender. Alsharafat et al. (2017) found that with the same use of a digital game, female students performed better than male students in English vocabulary achievement. However, a contradictory finding was reported by Zhonggen (2018) in that male students performed better than female students in English vocabulary acquisition. Therefore, the different effects of digital game-based learning on different genders is an important area for future study.

Although the majority of the studies supported the use of digital games for English vocabulary acquisition, I observed that many of the studies had a poor experimental design. Additionally, most of studies did not provide theoretical premises embedded in the educational digital games they chose. Therefore, it was vague as to how the game produced an effect on English learners in terms of the education design. As a result, high-quality experimental studies with a focus on educational design are needed.

What Are the Features of the Existing English Vocabulary Digital Games in the Marketplace for EFL?

The content analysis of extant vocabulary digital games on secondary EFL learners in China in Chapter Three revealed that even though these games were marketed as effective, fun games, there was a lack of diversity in learning opportunities to acquire vocabulary words in these games. The learning scenes designed in these games were nearly the same and could not facilitate comprehensive inputs. Whether these games could produce a more effective way for students to develop vocabulary than traditional ways like vocabulary books is questionable. In particular, in these studies, players were not allowed to interact with their peers during game play. Peer interaction, however, is critical for a successful educational digital game because players can get cooperation and communication which lead to active learning and self-regulation (Burguillo, 2010; Jong et al., 2013). Additionally, acquiring vocabulary is a long-term process. Encoding and retrieval should be incorporated when digital games are designed. However, across all these games, balanced pedagogical supports across these two processes were not provided. None of these games offered diverse and adequate learning opportunities across learning phases.

Also, in these games, the most used pedagogical supports like Chinese definition, word formation, and translation could be identified easily in non-digital language learning materials like vocabulary books. Therefore, the digital games in this study failed to maximize the use of their full potential to help EFL vocabulary learning in terms of pedagogical approaches.

According to the content analysis of digital games in English vocabulary learning, severely limited learning opportunities were facilitated for EFLs in China, and also there is a lack of diversity in the use of pedagogical supports for the secondary school EFLs in China. Therefore, I concluded that the existing digital games failed to provide secondary students with high-quality vocabulary learning. This finding comes with an acknowledgement of the huge potential of educational digital games to produce learning effectiveness.

What Are Teacher-Perceived Key Elements in An Effective English Vocabulary Digital Game for EFL Learners?

In the qualitative study in Chapter Four, I examined teachers' perceptions of an effective English vocabulary digital game for secondary EFL learners in the context of China. A thematic analysis was used to explore key elements of an effective English vocabulary digital game. Three themes with eleven key elements were identified. They are diverse functions, daily life application scenario, proper amount of learning content for each level, play time control, cartoon art style, textbook related content, popular platform, enough practice, simple and smooth flow, vocabulary visuals, and theme-based vocabulary based on frequency order. These elements were discussed as elements which can decide or influence the effect of a vocabulary digital game for EFLs.

Among these elements, two—diverse functions and inclusion of a daily life application scenario— were mentioned by more than half of the teacher participants, and the other nine elements were mentioned by the less than half of the teacher participants. All these elements identified, however, are supported by existing theories or studies.

Diverse functions may be the important element for an effective English vocabulary digital game, which corroborated with Krashen's (1982) input hypothesis which states that in language acquisition, diverse and comprehensive inputs should be adopted in the learning process. Diverse function of a digital game is one way to form comprehensive input. Chen et al. (2018) found that diverse functions can be an effective element which makes a player engage in diverse motivational and cognitive facilitation through cooperation, playing, and strategizing. In addition to the element of diverse function, inclusion of a daily life application scenario is also regarded as a critical element for a successful vocabulary digital game. The design of connecting students' daily life was endorsed by the study of Hao et al. (2019). According to their study, authentic situations are a contributing element for the effectiveness of a vocabulary digital game.

In order to confirm the effective elements, quantitative studies are recommended. Further exploration should test these elements using a rigorous research design, and controlled randomized studies should be conducted to provide the field with strong evidence that digital games are effective for EFL/ESL students' learning. In terms of educational game designing, these eleven elements should be incorporated in the framework for an effective English vocabulary digital game.

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