The Role of Digital-Game Based Language Learning in EFL Vocabulary Learning and Retention: A Case Study at a Higher Educational Institute in Oman

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Abstract—This study investigates the role of Digital-Game Based Language Learning (DGBLL) in helping students learn and retain English vocabulary items in a foreign language context. Using a quantitative approach, data was collected from 80 students enrolled in four different levels of the General Foundation Program at the University of Technology and Applied Sciences, Ibra, Oman. The students were exposed to practice learning the meaning of ten vocabulary items per level using Kahoot and Wordwall games. Three tests were administered: a pre-test in week 1, a post-test after practicing the vocabulary items using the previously mentioned digital games in week 4, and a retention test in week 6. In addition, students' perceptions regarding the efficacy of DGBLL in the vocabulary learning process were measured via a questionnaire following the post-test. The findings indicated the students' positive attitudes in terms of utilizing DGBLL as a learning approach to mastering vocabulary regardless of gender or class level. Additionally, the findings demonstrated the effectiveness of DGBLL in vocabulary learning and retention. Hence, the study recommends using digital games to promote vocabulary learning and retention, resulting in a more engaging foreign language educational environment.

Index Terms—MALL, DGBLL, vocabulary learning, vocabulary retention

I. INTRODUCTION

Vocabulary is given considerable importance in the field of language research, as it is considered crucial for attaining language proficiency. It is also unarguably fundamental for the development of all four language skills: listening, speaking, writing, and reading. In fact, vocabulary helps learners to be more fluent, leads to better academic achievement, and boosts thinking and communication skills because words are considered tools to analyse, infer, and evaluate ideas. In the same vein, Alzahrani (2016) claims that to learn the target language effectively, learners need to develop a vocabulary that facilitates the learning process and enables them to be better readers and listeners. Furthermore, they cannot express themselves in writing and speaking skills without having some appropriate vocabulary knowledge. This is because a limited vocabulary repertoire may lead to unsuccessful communication.

Several researchers and educators use educational technology to facilitate foreign language vocabulary acquisition. Some confirmed that the use of digital games in the educational field has positively impacted students' learning (Guarini et al., 2022; Peconio et al., 2022). Game-Based Language Learning (GBLL) is one of the approaches used for this purpose. In this strategy, games are used to immerse students in vocabulary learning. Guarini and Peconio claimed that games are invaluable as they allow learners to practice language skills. Many studies have investigated digital games' benefits in vocabulary acquisition. For instance, the study conducted by Roslin and Hosseinpour (2021) provided empirical evidence of the potential effectiveness of some digital games used as interventions during online vocabulary instruction to enhance motivation for learning and retention. Similarly, Kazu and Kuvvetli (2023) mentioned in their research that "QUIZZIZ" as a digital game improved students' motivation to learn vocabulary.

Despite the myriad studies on DGBLL and vocabulary learning, poor vocabulary levels are still a pressing problem. More studies, therefore, need to be conducted to evaluate the effectiveness of DGBL in improving learners' vocabulary. Hence, the researchers find it necessary to conduct the current study which incorporates digital vocabulary games to enhance the learning and retention of vocabulary in an EFL context.

II. LITERATURE REVIEW

It is evident that resorting to memorization in teaching vocabulary is not advisable (Decarrico, 2001). Such traditional teaching methods may hinder the potential for involving the student in the learning process as the teacher is

seen as the 'controller of the class' (AlNatour & Hijazi, 2018). For this reason, technology integration in the classroom is crucial to creating a vibrant and productive learning environment. Teachers can use digital technologies to create engaging lessons and accommodate different learning styles. A variety of multimedia materials are available through educational applications, internet resources, and interactive software, which turns vocabulary lessons into engaging experiences. However, resorting to any means of technology to teach vocabulary should rely on a solid foundational theory. One of those theories is the Constructivist Learning Theory, which was originally proposed by Vygotsky (1978). The theory suggests that a good learning environment should guarantee a level of interaction between the learners and their peers as well as their instructor. For Vygotsky (1987), the instructor is seen as a facilitator and a source of knowledge who is responsible for providing tools for the learners to help them build their knowledge. Moreover, Burner (1966) contends that the Constructivist Learning Theory necessitates that knowledge is actively constructed by the learners through retrieving their background and current knowledge in a suitable learning environment.

According to Stockwell (2012), Technology Enhanced Language Learning (TELL) is any form of language learning facilitated by the use of technology. TELL allows learners to control their learning pace, focus on their individual needs, and receive immediate feedback (Warschauer & Healey, 1998). Stockwell (2012) suggests that TELL is an umbrella term under which three other categories of technology-assisted teaching fall; namely, Computer Assisted Language Learning (CALL), Mobile Assisted Language Learning (MALL), and Digital Game-Based Language Learning (DGBLL). The current study experiments with integrating MALL and DGBLL into one approach to teaching vocabulary.

The integration of games into the classroom environment is crucial as it turns education into an interactive and captivating experience. In addition to grabbing students' attention, games also create a joyful and upbeat environment that encourages a love for learning. Games provide meaningful contexts for learning modern English vocabulary and help learners gradually improve their skills in vocabulary building (Cameron, 2001; Huyen & Nga, 2003). Hooshyar et al. (2016), believe that DGBLL can be effective in improving various language skills such as vocabulary, grammar, and reading. Ho et al. (2021) perceive game-based learning as a set of exercises having a game at their core. One of those games was used by Zahro et al. (2013) to examine their effects on students' vocabulary achievement via crossword puzzles. They found that guessing games had a significant positive impact on students' vocabulary acquisition. Mahmoud and Tanni (2014) found that students' attitudes towards learning English were positively influenced by the use of games.

In 2003, Prensky coined the term 'Digital Game-Based Learning' (DGBL) while referring to the necessity of accommodating digital citizens in the classroom and meeting their needs. For him, digital citizens are learners who were born in the 21st century and are well-versed in using technology. Hence, devising a teaching strategy that integrates games into the teaching/learning process is invaluable. Digital-Game Based Language Learning has shown potential in developing learners' vocabulary acquisition (Alfuhaid, 2023). Most research outcomes have yielded positive effects of DGBL in language learning. In 2020, for instance, Moncada et al. made an effort to gauge the effect of digital games on learners' academic achievement; more precisely, how Kahoot affected students' acquisition of English through response games. In their quasi-experimental study, they used a pre-test and a post-test. Statistically, a significant difference was found between the group of students who used Kahoot and those who did not. Other researchers reached similar conclusions (Hung, 2011; Fotouhi-Ghazvini et al., 2009; Yip & Kwan, 2006; Zheng, 2008).

The recent developments in mobile technologies have entirely changed the teaching and learning process (Pavlik, 2015). George (2014) believes that MALL has reached new heights because of the development of mobile technologies. Mobile phones can open up new horizons with their unique features of accessibility, personalization, and probability (Saran & Seferoglu, 2010). Ally and Woodburn (2011) used mobile phones to teach grammar and vocabulary to L2 French students at the elementary level and found this method of learning useful as the students expressed interest in having more practice using their mobile phones. Another study carried out by Bouzaiane and Dayananda (2023) revealed that WhatsApp as a mobile phone application was proven to be effective in teaching Omani University students 15 phrasal verbs. Shahbaz and Ishtiaa Khan (2017), in turn, studied the efficiency of mobile applications in teaching 40 phrases compared to conventional activities. In their quasi-experimental research, they devised a pre-test and a post-test. The results showed that the participants in the experimental group performed significantly better in the post-test; thus, they found the mobile application to be effective.

Numerous studies attempted to examine the impact of mobile devices on vocabulary learning (Abbasi & Hashemi, 2013; Agca & Ozdemir, 2013; Amer, 2010; Basoglu & Akdemir, 2010; Chen 2013); however, some have found no statistically significant difference between using mobile applications in language learning and the traditional method of instruction. (Alemi et al., 2012; Fisher et al., 2009; Stockwell, 2010; Tosun, 2015), while others have found a moderate mean effect of mobile phones on education (Alrashedi & Capretz, 2015; Sung et al., 2016; Wong & Looi, 2011). Mahdi (2017) conducted a meta-analysis on research that compared the performance of learners who learned vocabulary using mobile devices to those learning using the traditional method of instruction. He found that the effect varied according to age and type and aspect of the vocabulary used in the teaching/learning process. In other words, using mobile phones resulted in higher achievement in productive and receptive vocabulary learning. However, adults seemed to benefit more than young learners. Dagdeler et al. (2020) studied the effectiveness of mobile applications in vocabulary knowledge improvement for 73 students at two universities in Turkey and found a significant difference between the

experimental group and the control group in terms of receptive vocabulary knowledge, while they found no difference in retention tests. They concluded that mobile applications were good only receptively for short-term memory.

For language learners to fully master the target language effectively, their vocabulary repertoire must be developed (Alzahrani, 2015). They are expected to be proficient at dealing with unfamiliar vocabulary items throughout their language acquisition journey (Huyen & Nga, 2003). However, "learning new words is a cumulative process, with words enriched and established as they are met again" (Nation, 2000, p. 6). Thus, teaching only a small set of vocabulary at a time is essential for efficient language learning and retention. By concentrating on a small list of terms, students can explore the subtleties of each word in greater detail, leading to a deeper comprehension of how they are used and understood in context. Groot (2000) believes that teaching a huge amount of vocabulary is not feasible as there will be less time available for students to master other skills. Nation (2005) adds that English teachers can teach a limited amount of vocabulary each session. For this reason, the present study confined the scope of vocabulary to a limited set of items to be used while conducting the research.

Learners' attitudes and perceptions towards the use of digital games and mobile phones in the classroom have been heavily examined. In their study, White and Mills (2011) found that learners generally have positive attitudes toward using smartphones for language learning. Camilleri and Camilleri (2017) conducted a study to scrutinize the significance of using educational technologies on learning and students' perceptions of the use of digital games in class by following a qualitative method of semi-structured interviews. They found that engagement in blended learning improved the students' critical thinking and interpersonal skills as they worked in teams, and the students acknowledged that, in many respects, ubiquitous technology has improved their educational experience. Similarly, Anaraki (2008) found that the majority of participants in the study have a positive attitude towards mobile learning. Alzahrani (2015) attempted to find out the extent to which mobile phones can be used to aid students' development of their vocabulary. Publications related to MALL were reviewed and the findings revealed that mobile technology assisted learners in developing their vocabulary. Furthermore, the participants held positive attitudes towards using mobile technologies in learning new vocabulary. Alhabahba et al. (2014) examined Saudi students' behavioral factors that affect utilizing mobile phones in vocabulary learning and found that the students had positive attitudes toward vocabulary learning using mobile phones. Likewise, Amry (2014) conducted a study to measure the impact of mobile phones on Saudi students' attitudes and concluded that there was a significant success in students' performance because of mobile phones. In the same vein, Moncada et al. (2020) found that the learners in their study had positive attitudes toward using Kahoot as a means of improving their academic performance. Jamaatthuddin and Or-Kan (2021) examined students' perceptions of the effectiveness of using game-based learning to learn English for students in higher education through the use of questionnaires and interviews and found that most students believed that game-based learning methods are effective in learning English. Studies examine how gender differences in perceptions occur while using games and technology to learn vocabulary. Yang (2012) conducted research in Taiwan and found no significant differences between male and female participants' attitudes on MALL. The outcomes of the interviews showed that males are more used to using mobiles as a learning tool while the females viewed mobile phones as an entertainment facility. Viberg and Gronlund (2013) conducted a study on Chinese and Swedish students and found that females were more positive about using mobile phones in learning. Cai et al. (2017) conducted a meta-analysis of 50 studies and found that males showed a more positive attitude toward using technology than females, especially in aspects of belief and self-efficacy. Nonetheless, he contends that it is still unclear whether differences in adoption and use of technology exist between the two genders. Such conflicting research outcomes regarding the role of gender in students' perceptions of using technology, mobile phones, and games in the classroom make it necessary to include this variable in the current study and further examine its role in the Omani context.

In short, the literature necessitates the significance of conducting further research related to using digital games in the classroom especially as such research is scarce in the Omani higher education context. Researching the effect of such technology-driven educational methods may foster a more engaging learning environment for Omani students.

III. RESEARCH METHODOLOGY

The current research employed a quantitative approach to investigate the following research hypotheses:
1. Students have positive attitudes towards DGBLL as a learning approach.
2. Students' perceptions of using DGBLL in vocabulary learning significantly correlate with class level.
3. Students' perceptions of using DGBLL in vocabulary learning significantly correlate with gender.
4. The DGBLL approach is effective in learning vocabulary.
5. The DGBLL approach has an effective role in vocabulary retention.

A. Sampling

The sample considered in this study was a subset of a large population of Omani EFL university students enrolled in levels 1, 2, 3, and 4 at the University of Technology and Applied Science –Ibra (UTAS-IBRA). The participants were 80 students aged 18 to 20. The sample number was decided according to the convenience of the researchers, and it was also chosen because of its practicality of being easy to handle.

B. Ethical Issues

The ethical Approval Form was filled out before the collection of data, as required by the Research and Consultancy Committee in the Foundation Program at UTAS-IBRA. Then, the approval for the research proposal and permission to conduct the research study were obtained from the committee. Subsequently, participants signed a consent form after being informed that participation was voluntary and being briefed about the study objective. They were also informed that the data collected during the study would remain confidential and participants would be anonymized.

C. Data Collection

The participants conducted a pre-test comprising multiple choice questions on 10 given vocabulary words selected from the target vocabulary of each level on week 1. The number of words is fixed to be only 10 for each level because according to Nation (2000) teaching only a small set of vocabulary at a time is essential for efficient language learning and retention. Following this, each group practiced learning the vocabulary words using Wordwall and Kahoot digital games over 2 weeks. These games have various playing options, enabling the students to learn the words in different ways while playing. In the fourth week, a post-test was administered to assess how well the participants had learned the given vocabulary through the digital games. Next, a structured questionnaire consisting of 10 items on the students' perceptions of the usefulness of DGBLL in learning vocabulary was administered. Each item was rated on a 5-point Likert scale, ranging from 1 (strongly agree) to 5 (strongly disagree). Finally, after two weeks, a post-interval test was conducted to measure the effectiveness of the digital games in vocabulary retention.

D. Reliability and Validity of the Tools

A constant comparison was resorted to ensure the higher reliability of the questionnaire. They regularly reviewed and updated the questionnaire items. In addition, a colleague reviewed the questions and examined whether they reflected the topic to be assessed, that is, participants' perceptions regarding the usefulness of DGBLL in EFL vocabulary learning. Moreover, Cronbach's alpha is also used to ensure the reliability of the questionnaire, and it is found to be .7, which showed that the questionnaire was highly reliable.

As for validity, the questionnaire items were translated into Arabic by a native Arab speaker to make sure that students understood all the items and responded accurately, contributing to the validity of the findings.

As for the tests, an experienced native English lecturer reviewed the content, validity, and level of difficulty of the questions. Based on his suggestions and comments, the questions were revised. Overall, the reviews of the tools and suggestions for the tools' improvements reinforced the reliability of the data collection tools and the validity of the findings as well.

IV. DATA ANALYSIS

Students' responses to the given questionnaire were entered into an SPSS database for descriptive analysis. The Principal Component Analysis (PCA) was conducted for two fixed factors using varimax rotation to analyse the questionnaire items, resulting in two components. Correlation was also used to investigate the effect of class level and gender on students' perceptions of using DGBLL to learn vocabulary. As for analysing the effectiveness of DGBLL in vocabulary learning and retention, a Wilcoxon Signed Rank Test was implemented.

V. RESULTS

A. Participants' Demographics

As illustrated in Table 1, 80 students participated in this research. Detailed information about the distribution of the study's participants by gender and class level is provided below.

TABLE 1
THE DISTRIBUTION OF THE SURVEY'S PARTICIPANTS BY GENDER AND CLASS LEVEL GENDER

		Male	Female	
Level	Level 1	3	9	12
	Level 2	12	11	23
	Level 3	14	9	23
	Level 4	11	11	22
Total		40	40	80

B. Validity of the Questionnaire

First, the Kaiser-Meyer-Olkin (KMO) and Bartlett tests (Table 2) were carried out to explore the rightness of the data for Principle Component Analysis (PCA). The validity measure of the students' Perceptions of the Usefulness of Digital Games in Language Learning (SPUDGBLL) questionnaire was found to be 0.000, which is lower than 0.05 degree of probability. It, therefore, shows that the validity could be measured.

TABLE 2
KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.762
Bartlett's Test of Sphericity	Approx. Chi-Square	246.849
	df	45
	Sig.	.000

The loading of the questionnaire items was done using PCA and Pearson's correlation was also employed to determine the extent of association amongst the extracted items. This resulted in two components as shown in Table 3 below: items 1 to 7 (AUDGBLL) loaded onto factor 1, and items 8 to 10 (DUDGBLL) being loaded on factor 2.

TABLE 3
FACTOR LOADS OF SPUDGBLL COMPONENTS

	Advantages of using DGBLL	Disadvantages of using DGBLL
Q1	.671	-.082
Q2	.827	-.097
Q3	.721	-.177
Q4	.713	.011
Q5	.771	-.079
Q6	.541	.052
Q7	.679	-.010
Q8	.228	.707
Q9	.145	.866
Q10	.009	.769

Extraction Method: Principal Component Analysis.
a.   2 components extracted.

C. Reliability of AUDGBLL and DUDGB

As indicated in Table 4, the component AUDGBLL with 7 items has a reliability index of .827 which is considered highly significant according to Cohen's table of effect sizes. This is a strong internal consistency between the items of this component making it a suitable factor for data collection and analysis. Similarly, the component DUGBLL is highly reliable, for the reliability index indicates .7.

TABLE 4
RELIABILITY OF AUDGBLL AND DUDGBLL

	Cronbach's Alpha
Items 1 to 7 (AUDGBLL)	.827
Items 8 to 10 (DUDGBLL)	.7

D. Students Perceptions of Using DGBLL in Vocabulary Learning

As indicated in Table 5 and according to the mean interpretation, students strongly agreed that using DGBLL for vocabulary learning is highly beneficial, for the mean values of the items range from 4.10 to 4.49. The findings corroborate that of Kazu and Kuvvetli (2023) in terms of students' positive attitudes toward the usefulness of DGBLL in vocabulary learning. Similarly, Jamaatthuddin and Or-Kan (2021) found that most students believe that game-based learning methods are effective in learning English and different conventional learning styles.

Participants also perceived DGBLL as a tool that can enhance and accelerate the process of vocabulary learning. They considered digital games as enjoyable, motivating, and interactive aids to learn vocabulary and; therefore, can be used to learn other language components or skills. Accordingly, digital games may not only foster a competitive spirit among students but also develop relationships and foster collaboration within the classrooms when playing in groups. They also view DGBLL as a convenient means to enhance autonomous learning. This overlaps with the finding of Cárdenas et al. (2020) which indicated that student perceptions of and attitudes towards the use of Kahoot as a digital game were found to be highly positive, contributing to better academic performance. In the same vein, the results of this study confirm the findings of Hung et al. (2018), in that both suggested the overall feasibility of using digital games for promoting language learning in various aspects.

However, the mean scores of items 8, 9, and 10, constituting the factor of DUDGBLL range between 2.83 to 2.96, and according to the mean score interpretation, it seems that students are neutral towards the notion indicating that the use of DGBLL could be time-consuming in the classroom or cause students to lose focus throughout the lesson. They did not express whether DGBLL could embarrass students in class when not achieving a good score while playing the games in the classroom or not.

TABLE 5
DESCRIPTIVE STATISTICS OF SPUDGBLL

	N	Mean
Q1	80	4.44
Q2	80	4.33
Q3	80	4.49
Q4	80	4.21
Q5	80	4.29
Q6	80	4.10
Q7	80	4.20
Q8	80	2.96
Q9	80	2.91
Q10	80	2.83
Valid N (listwise)	80	

E. Students' Perceptions of Using DGBLL in Vocabulary Learning and Class Level

The correlation between students' perceptions of using DGBLL in vocabulary learning and class level can be seen in Table 6 below:

TABLE 6
CORRELATION BETWEEN SPUDGBLL AND CLASS LEVEL

		SPUDGBLL
	Pearson Chi-Square	61.970
Class Level	Sig. (2-tailed)	.213
	N	80

The second hypothesis regarding question 1 presumes that students' perceptions of using DGBLL significantly correlate with class level. However, the correlation test (Table 6) lends no empirical support to this hypothesis, for the correlation between students' perceptions of using DGBLL and level is proved to be non-significant ($\chi2$ = 61.97, p =.213 > .05). Hence, the second hypothesis is rejected. In other words, the class level has no bearing on students' perceptions of using DGBLL in vocabulary learning.

F. Students Perceptions of Using DGBLL in Vocabulary Learning and Gender

The correlation between SPUDGBLL and gender is indicated in table 7 below:

TABLE 7
THE CORRELATION BETWEEN SPUDGBLL AND GENDER

		SPUDGBLL
	Pearson Chi-Square	25.594
Gender	Sig. (2-tailed)	.137
	N	80

The third hypothesis suggests that students' perceptions of using DGBLL in vocabulary learning correlate with gender. However, Table 7 indicates that the result does not support this hypothesis. After conducting the Chi-Square test to examine the correlation between gender and SPUDGBLL, the test yields a non-significant correlation ($\chi2$ = 25.594, p = .137 > .05). Therefore, it is safe to conclude that there is no difference between male and female students in their perceptions of using DGBLL to learn vocabulary. This is similar to the finding of Yang (2012) who found in his research that there were no significant differences between male and female participants' attitudes towards MALL. This contradicts the findings of Viberg and Gronlund (2013) and Cai et al. (2017). The former conducted a study in Chinese and Swedish contexts and found that females were more positive about using mobile phones in learning. However, Cai et al. (2017) who conducted a meta-analysis of 50 studies revealed that males showed a more positive attitude toward using technology than females, especially in aspects of belief and self-efficacy.

G. The Role of DGBLL in Vocabulary Learning

Since we had a small sample size per level where the number of participants was less than 50, determining the distribution of the test scores (T1, T2, and T3 scores) was important for choosing an appropriate statistical method. So a Shapiro-Wilk test was performed and showed that the distribution of the three test scores across the four levels departed significantly from normality (for T1, W = .96, p = .006, T2: W= .97, P=.04. , and T3: W=.94, P=. 001). Based on this outcome, a non-parametric Wilcoxon Signed Rank Test was applied, and the median with the interquartile range was used to summarize the scores of T1, T2, and T3.

H. Effectiveness of DGBLL in Vocabulary Learning

As indicated in Table 8, a Wilcoxon Signed Rank Test revealed that the scores of the post-test (T2) were significantly higher after implementing DGBLL in the process of vocabulary learning (Md = 6, N= 80) compared to the scores of the pre-test (T1) (Md = 5, N =80), z= -3.02, P=.003. This indicated that students in the different levels have significantly

benefitted from using DGBLL in learning the vocabulary items. It, therefore, highlighted the importance of DGBLL in the vocabulary learning process and confirmed hypothesis 4. This is supported by the study of Dagdeler et al. (2020) who asserted the effectiveness of mobile applications in vocabulary knowledge improvement for 73 students at two universities in Turkey.

TABLE 8
A WILCOXON SIGNED RANK TEST (T1 AND T2)

	Pre-test (T1)	Post-test (T2)	W (T2 - T1)
Median	5	6	
Z			-3.018
Asymp. Sig. (2-tailed)			.003

I. The Impact of Using DGBLL on Vocabulary Retention

The same test was run to determine whether DGBLL promoted recalling the learned vocabulary. The result was statistically significant and it is safe to conclude that DGBLL helped students remember the vocabulary they learned, confirming hypothesis 5. The Wilcoxon Signed Rank Test showed that the scores of the after-interval test (T3) were statistically different from T1 scores (Md (T1)= 5, N=80, Md (T3) = 6, N =80), z= -4.05, P=.000)) and were statistically not different from T2 scores (Md (T2) = 6, N= 80, Md(T3)=6, n=80, Z= -1.81, p=0.7).

TABLE 9
A WILCOXON SIGNED RANK TEST (T1, T2, AND T3)

	Median (Md)	W (T3 - T2)	W (T3 - T1)
T1	5		
T2	6		
T3	6		
Z		-1.808b	-4.048b
Asymp. Sig. (2-tailed)		.071	.000

The finding contradicts that of Dagdeler et al. (2020) who revealed that educational games are proven to be ineffective in vocabulary retention. They concluded that mobile applications were good only receptively for short-term memory. This can be further investigated by making the period between the post-test and after-interval test longer for future studies to have better insight into the effectiveness of digital games in vocabulary retention.

VI. CONCLUSION

In this research, it was concluded that most of the participants expressed positive opinions toward the usefulness of DGBLL in the vocabulary learning process. This was supported by the analysis of the efficiency of DGBLL in vocabulary learning and retention through analysing the tests' scores. It was also found that there were no correlations between students 'perceptions of using DGBLL to learn vocabulary and class level or gender. This highlighted that the mentioned independent variables had no impact on students' opinions toward the use of DGBLL in learning and retaining the vocabulary items.

VII. LIMITATIONS AND RECOMMENDATIONS

What can be noted as far as the future avenues of research on the use of DGBLL in language learning in Omani university settings are concerned is that research should go beyond the limit of just assessing the students' perceptions of using DGBLL or evaluating the effectiveness of DGBLL in the process of vocabulary learning towards probing into factors impacting the successful use of digital games in language learning, such as learning styles. This will give the researchers insight into the types of games to be implemented. Little research has been published about the use of DGBLL in language learning in the Omani context, which outlines the crucial need for further investigating this field. Hence, this study establishes grounds for further research in Omani university education.

The present study has two limitations. First, the current research included participants only from one branch of the University of Technology and Applied Sciences (UTAS) which includes seven branches. Thus, the generalization of its findings cannot be warranted. It would therefore be of vital importance that future studies should involve a large sample of students from other branches that fall under the umbrella of UTAS. Another limitation has to do with data collection; the current study collected data using a questionnaire and three tests from the same groups. It would be better to have a control and experimental group design to investigate the effectiveness of DGBLL in vocabulary learning and retention in greater depth. It is also recommended that an interview be conducted at the end of data collection to enhance the validity and credibility of the findings.

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