

Effect of Animated Infographics on Vocabulary Gain and Retention of Iranian Intermediate EFL Learners

Shahla Tavanapour¹, Azizeh Chalak², Hossein Heidari Tabrizi³

¹ Ph.D. Candidate, Department of English, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran, Email: shahla_tavana2006@yahoo.com

² *Corresponding Author*, Associate Professor, Department of English, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran, Email: azichalak@gmail.com

³ Associate Professor, Department of English, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran, Email: heidaritabrizi@gmail.com

Abstract

With the rapid development of technology, multimedia comes into English classes and positively improves learners' language proficiency. The present study attempted to consider the use of animated infographics on the vocabulary gain and retention of Iranian intermediate EFL students. The classes were held online through the Jitsi meet website in the autumn of 2021. To this end, 60 EFL students were selected among 90 students through a homogeneity test. At the beginning of the treatment period, a pretest was administered to both groups, and then, the participants attended 13 sessions. In these sessions, the animated group (AG) was taught through animated infographics, while the control group (CG) was instructed conventionally. The posttest and delayed posttests were administered to test the student's vocabulary gain and retention. The findings indicated that the AG outperformed the CG significantly in the posttest and delayed posttest. Therefore, the animated infographics proved to be more effective in learning English vocabulary for these students. The results could have implications for teachers because it heightens their understanding of using technologies in general and animated infographics in particular and leads to more effective teaching methodologies.

Keywords: animated infographic, EFL learner, retention, vocabulary gain

Received: July 1, 2021

Revised: October 27, 2021

Accepted: January 26, 2022

Article type: Research Article

DOI:10.22111/IJALS.2022.7395

Publisher: University of Sistan and Baluchestan

© The Author(s).



How to cite: Tavanapour, Sh., Chalak, A., & Heidari Tabrizi, H., (2022). Effect of animated infographics on vocabulary gain and retention of Iranian intermediate EFL learners. *Iranian Journal of Applied Language Studies*, 14(2), 17-30. <https://doi.org/10.22111/IJALS.2022.7395>

1. Introduction

Today, EFL teachers need to adapt their methods according to fast-changing technology. Gilakjani and Sodouri (2017) pointed out that the classical methodologies in the conventional classes changed due to technology. Among those technologies, multimedia has received particular attention. Embedding text, graphics, drawing, audio, animation, and interactive content is referred to as multimedia (Brett, 1998; Mayer, 2005). In other words, multimedia is the presentation of material in a variety of formats. Therefore, one of the main objectives of the studies was to facilitate language learning with multimedia material, and the purpose of this study was to test one of them, animated infographics. Animated infographics refer to the graphics posted on graphic animated video screens on video websites such as YouTube, television commercials, animated presentations on smartphones, etc (Hassan, 2016).

Some teachers face difficulties in teaching new vocabulary to their students (e.g. Ghonsooly et al., 2012; Malmir & Parhizkari, 2021; Shabani et al., 2018; Taghizadeh & Zafarpour, 2022). Learning vocabulary is one of the biggest problems for some learners, and how learners acquire new vocabulary has recently received attention (Surmanov & Azimova, 2020). It is beyond doubt that teaching vocabulary via the traditional methods in EFL classes is tedious and tiring. Some researchers like Coniam and Wong (2004) stated that technology provides a non-threatening environment. Therefore, it lowers the affective filter for learning so that the personal interest and relevance factors can engage the students in using the language in meaningful ways (Coniam & Wong, 2004). Furthermore, Genclter (2015) believes that technology provides rapid and appropriate information and increases learners' motivation. Moreover, Ahmadi (2018) concluded that using technology in the class provided opportunities for interaction and promoted the learners' autonomy and motivation. Although some traditional teachers have utilized statistic posters to display and present the new content, multimedia such as animated infographics can be more useful in educational contexts (Bicen & Beheshti, 2017). Nowadays, multimedia can be helpful in many ways. They can be used in the arts, science classes, universities, and colleges to improve lesson planning and other aspects of the teaching and learning environment.

Previous studies (e.g., Peters & Webb, 2018; Putra, 2021; Rodgers & Webb, 2019; Zarei & Oruji, 2019) have shown the usefulness of multimedia and infographics in educational contexts, enabling learners to participate effectively in learning and facilitating the rate of the learning process. Some studies have found that static infographics are more effective for educational purposes, while others have concluded that animated types are more useful in teaching and learning (e.g., Lievemaa, 2017; Locoro et al., 2017; Ozdamli & Ozdal, 2018). As there are inconsistencies and differences in the results of previous research (Hassan, 2016; Peters, 2013) about the effect of different types of infographics in educational contexts, this study attempted to consider the effect of animated infographics on the vocabulary gain and retention of Iranian intermediate EFL students.

2. Literature Review

2.1. Theoretical Background

According to Zahedi and Abdi (2012), vocabulary is one of the most important elements in the use of a language. Ihbar and Said (2018) mentioned that vocabulary learning happens when a person acquires a new vocabulary and synthesizes it with basic knowledge. Furthermore, Krishnan and Yunus (2018) noted that the acquisition of a second language requires a knowledge of vocabulary. Since limited second-language vocabulary is a barrier to communication, vocabulary learning is necessary for second-language learners. As teachers have understood the role of vocabulary in language learning, the attention to vocabulary teaching has increased (Hunt & Begla, 2005). Folse (2004) states that acquiring vocabulary is essential for learning a foreign/second language. Furthermore, Hunt and Beglar (2005) point out that vocabulary is at the heart of language comprehension and production. It is also worth mentioning that vocabulary must not be underestimated because of its importance in learning a new language (Hoshino, 2010).

Traditional teaching has been radically changed with the development of technology (Taj et al., 2017). Technology can be used in vocabulary instruction as a supportive tool in the educational context. Hirschel and Fritz (2013) believed technology could display data in different modalities in various contexts. According to Gençler (2015), instructors who use technology could help learners identify appropriate activities for success. Eady and Lockyer (2013) point out that an integral part of the learning experience is using technology, and it's a significant issue for teachers and learners.

The recent development in computers and technology has led to a renewed interest in education for teachers and learners (Gilakjani & Sabouri, 2017; Hemmati & Azarnoosh, 2017).

Moreover, Gilakanjani and Sabouri (2017) mentioned that technology helps learners control their learning. Nowadays, technology is a significant component of many L2 classrooms. Among these techniques, multimedia has received particular attention. Instructors can utilize multimedia to increase language proficiency. Teachers can combine audio, texts, images, animations, and charts to provide information.

Today, the presentation of information has changed. With the rapid development of technology, multimedia comes into English classes and plays a positive role in improving the motivation and initiatives of students (Gilakjani & Sabouri, 2017; Iravi & Malmir, 2022). It can be mentioned that the growth of technology has facilitated the development of the English language (Ahmadi, 2018).

Many applications and software for learning environments are used for testing, distance education, ESP courses, spoken English, reading, and listening. In other words, multimedia creates an authentic environment that reflects students' experiences and stimulates the interest and motivation of students. There are numerous chances for learners to be exposed to authentic audiovisual information in the educational context. According to Canning-Wilson (2000),

multimedia can improve second/foreign language learning. Cakir (2006) mentioned that multimodal materials could facilitate learning and stimulate motivation.

Infographics as a multimedia tool can be a promising technique in the EFL class (Parveen & Husain, 2021). Infographics are classified into static and animated types. The static infographics include only texts and graphics without integrating any animated elements. While animated infographics have the data and pictures and the motion and the animated features, they are in a state of continuous movement (Afify, 2018). The animated infographics are used to convey and communicate a message and simplify the presentation of the data.

2.2. Studies Conducted on Infographics

Several attempts (e.g., Alqudah et al., 2019; Bicen & Beheshti, 2017; Ismaeel & AlMulhim, 2021) have been made to consider the influence of infographics on academic achievement in educational contexts. The effect of interactive and statics on the academic achievement of reflective and impulsive students was investigated by Ismaeel and AlMulhim (2021). Analyzing the collected data showed that interactive infographics were more effective than static ones. Moreover, the results showed that reflective learners outperformed impulsive learners on the posttest. The findings showed a significant difference between reflective and impulsive students regarding interactive infographics. Alqudah et al. (2019) considered the effect of the educational infographic on students' interaction and perception in Jordanian Higher Education. Students were instructed through infographic materials that the teacher developed. Meanwhile, the control group was instructed by the conventional method. Analyzing the pretest and posttest collected data revealed that infographics had a substantial effect on students' perceptions.

Numerous studies have concentrated on the effects of infographics on improving EFL learners' skills (Alrajhi, 2020; Kongwat & Sukavatee, 2019; Manowong, 2017; Pertiwi & Kusumaningrum, 2021). Pertiwi and Kusumaningrum (2021) examined the effects of infographic projects on speaking activities. The data were collected through observation, interviews, and questionnaires. The results showed that the infographic could facilitate speaking ability, and most of the students had positive attitudes toward creating and utilizing infographics in educational contexts. Alrajhi (2020) considered the effect of the static infographic on receptive knowledge of idiomatic expressions. The research studied the effectiveness of visualizing English idioms via static infographics. A pre/posttest, an attitude questionnaire, and interviews were instruments of the study. The control group was instructed through the online texts, whereas those in the experimental group were taught through online static infographics. Analyzing the data revealed a significant difference in scores. Furthermore, the participants had positive attitudes toward using infographics on learning idioms.

Several attempts (e.g., Alrewle, 2017; Bicen & Beheshti, 2019; Rahim et al., 2015; Supraba & Silvana, 2020) have been made to consider the attitudes of EFL students towards using

infographics in the EFL class. Alrewle (2017) conducted a study about using infographics on female students' achievement and examined their attitudes towards utilizing infographics in the EFL class. The collected data showed about 90 % of the learners in the animated group had a positive attitude toward using infographics in the EFL class. Bicen and Beheshti (2019) studied the psychological impact of infographics in education. The design was quantitative, and 163 undergraduate students were participants in the study. A questionnaire was used to investigate the students' perceptions about using infographics in education. The collected data revealed that infographics as graphic visual pictures present information and data effectively. They mentioned that instruction through infographics helps the teachers get knowledge visually and improve learning extensively in education.

2.3. Research Question

Although there has been an increasing number of research on both infographics and multimedia in educational settings (Alrwele, 2017; Rezaei & Sayadian, 2015), little attention has been paid to the effect of animated infographics on vocabulary gain and retention of Iranian intermediate EFL students. Based on the points raised above, this study was intended to answer the following research question:

Does an animated infographic significantly affect the vocabulary gain and retention of Iranian intermediate EFL students?

3. Methodology

3.1. Design and Context of the Study

This research adopted a quantitative quasi-experimental design to examine the influence of animated infographics on vocabulary gain and retention of Iranian intermediate EFL students. The participants were selected through convenience sampling from Abadan Medical University, Iran, in 2021. The classes were held online through Jitsi. Meet website. The treatment lasted 13 sessions. The independent variable in this study was animated infographics, and the dependent variables were gain and retention of vocabulary. Statistical Package for Social Science (SPSS) software version 24 was used for analyzing the data.

3.2. Participants

The participants were 90 EFL students from Abadan Medical University, Iran, through convenience sampling. A homogeneity test (Richards et al., 2008) was carried out among 90 students to show their degree of homogeneity. Subsequently, 60 students who scored a standard deviation above and below the average were selected as the participants in this study. All the

participants were between 18 and 22. They were both males and females, and all of them were at the intermediate level. The participants were randomly divided into animated and control groups, including 30 participants.

Table 1
Demographic Background of the Participants

No. of Students	60 EFL Students
Gender	30 Females & 30 Males
Native Language	Persian
University	Abadan Medical University, Iran
Academic Years	Autumn, 2021

3.3. Instrumentation

The first instrument was a homogenous test for determining the homogeneity of the groups at the intermediate level based on the “Interchange Passages Placement and Evaluation Package” extracted (Richards et al., 2008). This test included 50 multiple-choice grammar items, and its total score was 50. The reliability of the test was computed through the KR-21 formula ($r=0.87$).

Before the treatment, a vocabulary-based pretest was administered to both groups. A teacher-made test that measured the learners’ vocabulary knowledge was administered through Digi Survey before the treatment as the pretest. The test included 50 multiple-choice items, and each item had a score of one. The content and face validity of the test were confirmed by two experts in the field of SLA.

After the treatment, to evaluate the participants’ achievement during the course, the participants were given a post-test based on the instructed content during the treatment sessions. The posttest included 50 multiple-choice items and each item had a score of one. The time allocated for each test was about one hour.

Three weeks after the posttest, the same test was administered as a delayed posttest to the two groups to test their retention. The posttest and delayed posttest were the same, and the only difference was the ordering of the items to prevent the testing effect. To calculate the pre and posttest reliability, they were conducted with other students in the same faculties and studying the same course, but they were not involved in the treatment; then, through KR-21, the reliability was analyzed. Furthermore, the content and face validity of the test were confirmed by two experts in the field of SLA.

The next instrument was Storyline software for producing electronic content and e-learning in the form of a slideshow, which has many software features in one place to use their content only without the need for additional software. To create a slideshow of interactive e-learning courses with this software, the users can utilize the ready-made templates available in the program and, if necessary, customize and change the settings and features of the selected template. In addition, the

users can use the cartoon characters designed and available in the software to make the training more attractive.

Since this software is a complete version of PowerPoint, it uses most PowerPoint tools in the same PowerPoint style and context. Therefore, users who see the environment of this software for the first time will not be a strange thing for them. Moreover, in this software, the person encounters tools entirely similar to PowerPoint tools with the same performance. Inserting slides, changing the format of slides, arranging slides, adding animation, passing slides, adding text, and all are 100% similar to PowerPoint. More interestingly, the users can easily open and complete their PowerPoint projects in the Storyline environment.

3.4. Procedure

For this study, 90 female and male students who studied at Abadan Medical University, Iran, were selected. A test was administered to determine the EFL students' homogeneity at the intermediate level. Subsequently, 60 students who scored a standard deviation above and below the average were selected and comprised of two animated and control groups.

Following the homogeneity test, both groups were pretested. As the treatment, some new words from the content of the books were selected to be presented to the participants of both groups. The teacher taught the AG through animated infographics created by the storyline software. On the other hand, the CG was instructed through the conventional method such as the textbook. The treatment lasted 13 sessions and each session was about 60 minutes. In the first session, the students were homogenized; the selected participants were pretested in the second session. During the course, the teacher instructed the vocabulary to the CG conventionally, and in AG, the teacher utilized animated infographics. At the end of the treatment, the researcher administered the posttest to find out the possible effects of the treatment on the participants vocabulary improvement. And three weeks later, to test the EFL students' retention, a delayed posttest was administered to two groups. To calculate the tests' reliability, they were conducted with other students in the same university studying the same course but were not involved in the treatment. Then, the reliability was analyzed through KR-21.

4. Results

The present study examined the effects of animated infographics on vocabulary gain and retention of Iranian intermediate EFL students. Before conducting parametric statistics such as one-way repeated-measures ANOVA, these tests' assumptions had to be tested. One of these tests' most important underlying assumptions is the normality assumption, which was checked through the Shapiro-Wilk test of normality. In the test results, a *p*-value smaller than .05 would indicate the violation of the assumption of normality. In contrast, a larger than the significance level

p-value would mean that the normality assumption was met. Table 2 presents the results for the Shapiro-Wilk test of normality conducted on the scores obtained from the AG:

Table 2
The Results of the Normality Test for the Animated Group (AG)

	Statistic	<i>df</i>	<i>p</i> -value
Pretest	.943	30	.139
Immediate posttest	.951	30	.197
Delayed posttest	.941	30	.125

According to Table 2, the *p* values in the right column had values higher than the .05 level of significance. It indicated that the distributions of scores for the pretest, immediate posttest, and delayed posttest of the students in the AG were normal; hence, such parametric tests as one-way repeated-measures ANOVA could be conducted.

To test the research hypothesis, the AG’s pretest, immediate posttest, and delayed posttest scores were compared via a one-way repeated-measures ANOVA to track the changes the AG experienced. Table 3 demonstrates the results of the descriptive statistics of this comparison:

Table 3
Descriptive Statistics for the Pretest, Immediate Posttest, and Delayed Posttest Scores of AG

Tests	Mean	Std. Deviation	<i>N</i>
Pretest	10.38	1.59	30
Immediate Posttest	17.87	1.93	30
Delayed Posttest	18.78	1.23	30

Table 3 reveals that the mean score of AG for the pretest was lower than the immediate posttest mean score, which was in turn smaller than the delayed posttest mean score. To see whether the differences among these three mean scores obtained from the AG students were statistically significant or not, the researcher had to examine the *p*-value in Table 4:

Table 4
One-way ANOVA for the Pretest, Immediate Posttest, and Delayed Posttest Scores of AG

	Value	<i>F</i>	Hypothesis <i>df</i>	Error <i>df</i>	Sig.	Partial Eta Squared
Pillai’s Trace	.95	269.48	2.00	28.00	.000	.95
Wilks’ Lambda	.04	269.48	2.00	28.00	.000	.95
Hotelling’s Trace	19.24	269.48	2.00	28.00	.000	.95
Roy’s Largest Root	19.24	269.48	2.00	28.00	.000	.95

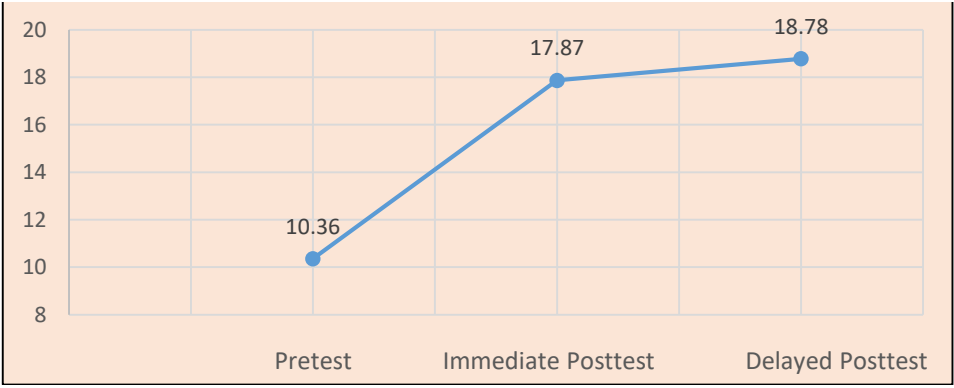
The *p*-value in Table 4 was lower than the significance level, suggesting that there was a significant difference among the mean scores of the AG on the pretest, immediate posttest, and delayed posttest. The post hoc test was conducted to determine where the differences were.

Table 5
Post Hoc Test for the Pretest, Immediate Posttest, and Delayed Posttest Scores of AG

Time		Mean	Std.	95% Confidence Interval for Difference		
		Difference	Error	Sig.	Lower Bound	Upper Bound
Pretest	Immediate Posttest	-7.49 [*]	.39	.000	-8.49	-6.49
	Delayed Posttest	-8.40 [*]	.35	.000	-9.30	-7.49
Immediate Posttest	Pretest	7.49 [*]	.39	.000	6.49	8.49
	Delayed Posttest	-.90 [*]	.25	.004	-1.54	-.26
Delayed Posttest	Pretest	8.40 [*]	.35	.000	7.49	9.30
	Immediate Posttest	.90 [*]	.25	.004	.26	1.54

Table 5 reveals that the difference between the pretest and immediate posttest mean scores of the AG was significant statistically. Similarly, the difference between the pretest and delayed posttest mean scores was statistically significant (i.e., $p = .000 < .05$). Finally, the difference between the immediate and delayed posttest scores reached statistical significance in favor of the delayed posttest scores. Thus, it could be argued that using animated infographics significantly boosted the AGs’ gain and retention of vocabulary. This result is also graphically represented in the following line graph:

Figure 1
Mean Scores of AG on the Pretest, Immediate Posttest, and Delayed Posttest



The graph in Figure 1 reveals that the immediate posttest and delayed posttest mean scores of the AG were significantly higher than their pretest mean scores. Furthermore, there was a considerable difference between the immediate posttest and delayed posttest mean scores of the AG, with the delayed posttest scores being higher than the immediate posttest scores. This gave rise to the disconfirmation of the second null hypothesis of the study and boiled down to the conclusion that using animated infographics led to fruitful results concerning vocabulary gain and retention of Iranian intermediate EFL students.

5. Discussion

The present study aimed to investigate the effect of using animated infographics on vocabulary gain and retention of Iranian EFL students across intermediate proficiency levels. The results showed statistically significant differences between the pretest, posttest, and delayed posttest scores of the students at the intermediate level. It was shown that using animated infographics positively affected helping Iranian EFL students to improve their vocabulary gain and retention at the intermediate level. The reasons behind these results could be discussed in terms of the effectiveness of infographics which can combine audio, texts, images, animations, and charts to provide information (Krum, 2013). One possible reason behind this improvement may be the fact that infographics as multimedia deliver abundant data in comparison with the traditional textbook and displays authentic content that is natural and closer to the real world. The idea behind the cognitive theory of infographic learning is a Dual coding theory (Clark & Paivio, 1991). According to Dual coding theory (DCT), materials can be presented in two ways; verbal associations and visual imagery. In other words, two different systems (verbal & nonverbal) exist to store information in human memory. Another possible reason could be that infographics summarize information through images and text and present data purposefully (Toth, 2013). The findings of this study agree with Pertiwi and Kusumaningrum (2021) that infographics could facilitate EFL students' skills. The collected data revealed that most students had positive attitudes toward using infographics in educational contexts.

This finding corroborates the ideas of Ridaillah (2018) ideas, who suggested that using infographics in the EFL class showed a significant effect on students' writing skills and that utilizing various infographics increased learners' motivation and attention. These findings further support the idea of Rezaei and Sayadian (2015) that infographics as effective multimedia could be used to help learners to develop their grammatical knowledge. The current study's findings are consistent with those of Kongwat and Sukavatee (2019). They found that infographics develop students' comprehension and encourage them to be more active in the EFL class. This also accords with earlier observations (Alrewle, 2017; Anissyatus, 2019; Iravi & Malmir, 2022; Yildirm, 2016), which showed that infographics could motivate and engage learners in the learning process. Moreover, these results are consistent with those of other studies. They suggest that using infographics in teaching English as a foreign language is effective because using infographics in class is challenging and effective for teaching and learning.

However, the current study's findings do not support the previous research. Hassan (2016) demonstrated that the static infographic is superior to the animated infographic. The reason might be to provide the learners with the entire poster graphics, texts, and all of the information simultaneously and receive the text and view the pictures until they comprehend all parts completely. Furthermore, these results differ from some published studies, such as Peters (2013), who concluded that using a static infographic is more effective than an animated one.

6. Conclusion

This study began with the assumption that animated infographics could enhance students' vocabulary. At this time, the researcher employed animated infographics during the treatment for the AG, while the conventional methods taught the CG vocabularies. After the posttest, the results indicated that animated infographics affect students' vocabulary knowledge. The present research results showed a statistically significant difference between the pretest, posttest, and delayed posttest scores of the students at the intermediate level. It was shown that using animated infographics played a positive effect in helping Iranian EFL students to improve their vocabulary gain and retention at the intermediate level. It could be said that animated infographics could be used as a strategy in the Iranian EFL context to facilitate the learning process. Thus, the conclusion that could be drawn is the use of technology such as animated infographics should be strongly stressed when vocabulary learning is the focus of the study.

The finding of this study could be helpful for language teachers because it heightens their understanding of using technologies in general and using animated infographics in particular and leads to more effective teaching methodologies. It is also recommended that language teachers discuss the value of using technologies and animated infographics in EFL writing classes. Moreover, EFL students need to recognize that developing and applying animated infographics could improve their vocabulary knowledge. Using animated infographics for vocabulary learning can result in successful learning among EFL students.

The present study examined the effect of using animated infographics on vocabulary gain and retention of Iranian intermediate EFL students. The following suggestions could be proposed for the researchers who want to conduct a study on vocabulary learning:

- 1) In this study, animated infographics were examined only, yet there is room for conducting other studies that can consider other kinds of multimedia.
- 2) In this study, animated infographics were inspected regarding vocabulary learning, yet there is an opportunity for conducting other studies that can consider other skills like listening or writing.

References

- Afify, M. K. (2018). The effect of the difference between infographic designing types (static vs. animated) on developing visual learning designing skills and recognition of its elements and principles. *International Journal of Emerging Technologies in Learning (IJET)*, 13(9), 204-223.
- Ahmadi, M. R. (2018). The use of technology in English language learning: A literature review. *International Journal of Research in English Education (IJREE)*, 3(2), 115-125.
- Alqudah, D., Bin Bidin, A., Azizul Hakim B., & Md Hussin, M. (2019). The impact of the educational infographic on students' interaction and perception in Jordanian higher education: Experimental study. *International Journal of Instruction*, 12(4), 669-688. <https://doi.org/10.29333/iji.2019.12443a>
- Alrajhi, A. (2020). Static infographics affect the receptive knowledge of idiomatic expressions. *Indonesian Journal of Applied Linguistics*, 10(2), 315-326. <http://doi.org/10.17509/ijal.v10i2.28596>
- Alrewe, N. S. (2017). Effects of infographics on student achievement and students' perceptions of the impacts of infographics. *Journal of Education and Human Development*, 6(3), 104-117.
- Anissyatus, S. (2019). *The Effect of Infographic Media on Students' Writing Skills (A Quasi-Experimental Study at the Eleventh Grade Students of SMA Nurul Muslim in the Academic Year 2019/2020)*. A Graduating Paper, Teacher Training, and Education Faculty, English Education Department, State Institute for Islamic Studies Salatiga. Counselor: Mrs.Sari Famularsih, S.Pd.I., M.A
- Bicen, H., & Beheshti, M. (2017). The psychological impact of infographics in education. *Broad Research in Artificial Intelligence and Neuroscience*, 8(4), 99-108. <https://www.edusoft.ro/brain/index.php/brain/article/view/733/821>
- Bicen, H., & Beheshti, M. (2019). The psychological impact of infographics in education. *Broad Research in Artificial Intelligence and Neuroscience*, 8(4), 99-1-8.
- Brett, P. (1998). Using multimedia: A descriptive investigation of incidental language learning. *Computer Assisted Language Learning*, 11(2), 179-200.
- Cakir, I. (2006). The use of video as an audio-visual material in foreign language teaching classrooms. *The Turkish Online Journal of Educational Technology*, 5(4), 67-72.
- Canning-Wilson, C. (2000). Practical aspects of using video in the foreign language classroom. *The Internet TESL Journal*, 5(11). <http://iteslj.org/Articles/Canning-Video.html>.
- Clark, J. M. & Paivio, A. (1991). Dual coding theory and education. *Educational Psychology Review*, 3, 149-210.
- Coniam, D., & Wong, R. (2004). Internet relay chat as a tool in the autonomous development of ESL learners' English language ability: An exploratory study. *System*, 32(3), 321-335.
- Eady, M. J., & Lockyer, L. (2013). *Tools for learning: technology and teaching strategies: Learning to teach in primary school*. The University of Technology.
- Folse, K. (2004). *Vocabulary myths*. Ann Arbor.
- Genclter, B. (2015). How does technology affect the language learning process at an early age?. *Proceda-Social and Behavioral Sciences*, 19(9), 311-316.
- Gilakjani, A. P., & Sabouri, N. B. (2017). Advantages of using a computer in teaching English pronunciation. *International Journal of Research in English Education (IJREE)*, 2(3), 78-85.
- Ghonsooly, B., Khajavy, G. H., & Asadpour, F. (2012). Willingness to communicate in English among Iranian non-English major university students. *Journal of Language and Social Psychology*, 31, 197-212.

- Hassan, H. G. (2016). *Designing Infographics to support teaching complex science subject: A comparison between static and animated infographics* [Masters thesis, Iowa State University]. <https://lib.dr.iastate.edu/etd/15716/>
- Hemmati, M. J., & Azarnoosh, M. (2017). The effects of visual-kinesthetic activities on ESP students' vocabulary learning. *Iranian Journal of Applied Language Studies*, 9 (Proceedings of the First International Conference on Language Focus), 51-60.
- Hirschel, R., & Fritz, E. (2013). Learning vocabulary: CALL program versus vocabulary notebook. *System*, 41(3), 639-653.
- Hoshino, Y. (2010). The categorical facilitation effects on L2 vocabulary learning in a classroom setting. *RELJ Journal*, 41, 301-312.
- Hunt, A., & Beglar, D. (2005). A framework for developing EFL reading vocabulary. *Reading in a Foreign Language*, 17(1), 23-59.
- Ihbar, M. Z., & Said, N. E. M. (2018). The effects of blended learning on EFL high school student's vocabulary mastery. *International Journal of Innovative Research and Creative Technology*, 4(6), 111-116.
- Iravi, Y., & Malmir, A. (2022) The effect of lexical tools and applications on L2 vocabulary learning: A case of English academic core words. *Innovation in Language Learning and Teaching*, 16(4). <https://doi.org/10.1080/17501229.2022.2102638>
- Ismaeel, D. A., & Al Mulhim, E. N. (2021). The influence of interactive and static infographics on the academic achievement of reflective and impulsive students. *Australasian Journal of Educational Technology*, 37(1), 147-162.
- Kongwat, A., & P. Sukavatee. (2019). The effects of collaborative reading instruction using infographics on students' reading comprehension. *Online Journal of Education*, 14(2), 67-85.
- Krishnan, P. D., & Yunus, M. M. (2018). Animated cartoons to develop listening skills and vocabulary. *International Journal of Engineering & Technology*, 7(4), 20-25.
- Krum, R. (2013). *Cool infographics: Effective communication with data visualization and design*. John Wiley & Sons.
- Lievemaa, J. (2017). *Animated infographics in digital educational publishing: A case study of educational animated infographics* [Doctoral dissertation]. <http://urn.fi/URN:NBN:fi:amk-2017060111854>
- Locoro, A., Cabitz, F., Actis-Grosso, R., & Batini, C. (2017). Static and interactive infographics in daily tasks: A value in use and quality of interaction user study. *Computers in Human Behavior*, 71, 240-257.
- Malmir, A., & Parhizkari, N. (2021). The effect of definition, fill-in-the-blank, and sentence writing exercises on the acquisition, retention, and production of lexical vs. grammatical collocations. *Journal of Teaching Language Skills*, 40(1), 33-82.
- Manowong, S. (2017). Incorporating online tools to promote English reading for EFL learners: An action research study. *Pasaa Paritat Journal*, 3(2), 98-124.
- Mayer, R. E. (2005). *The Cambridge handbook of multimedia learning*. Cambridge University Press.
- Ozdamli, F., & Ozdal, H. (2018). Developing an instructional design for infographics and evaluating infographics usage in teaching based on teacher and student opinions. *Eurasia Journal of Mathematics, Sciences and Technology Education*, 14 (4), 1197-1219.
- Parveen, A., & Husain, N. (2021). Infographics as a promising tool for teaching and learning. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 8(6), 554-559.
- Pertiwi, D. R., & Kusumaningrum, M. A. (2021). The infographic projects speaking activities. *Journal of English Language and Language Teaching*, 5(1), 52-62. <https://doi.org/10.36597/jellt.v5i1.10026>

- Peters, D. (2013). *Interface design for learning: Design strategies for learning experiences*. Pearson Education.
- Peters, E., & Webb, S. (2018). Incidental vocabulary acquisition through viewing L2 television and factors that affect learning. *Studies in Second Language Acquisition*, 40(3), 551–577.
<https://doi.org/10.1017/S0272263117000407>
- Putra, K. M. (2021). The use of infographics to enhance EFL students reading interest. *Journal of Educational Study (JoES)*, 1(1), 60-66. <https://doi.org/10.36663/joes.v1i1.154>.
- Rahim, N. N., Khidzir, N. K., Yusof, A. M., & Daud, K. (2015). *Towards a conceptual framework of animated infographics in the Islamic context. 1st International Islamic Heritage Conference (IsHeC 2015)*. Akademi Pengajian Islamic Kontemporari, UiTM Melaka.
- Rezaei, N., & Sayadian, S. (2015). The impact of infographics on Iranian EFL learners' grammar learning. *Journal of Applied Linguistics and Language Research*, 2(1), 78-85.
- Richards, J. C., Lesley, T., Hansen, C., & Zukowski, J. (2008). *Interchange passages placement and evaluation package (3rd ed)*. Cambridge University Press.
- Ridaillah, M. (2018). *The effect of the infographic on students' writing summary skills* [Masters thesis, Syarif Hidayatullah State Islamic University Jakarta].
<http://e-repository.perpus.iainsalatiga.ac.id/id/eprint/6370>
- Rodgers, M. P. H., & Webb, S. (2019). Incidental vocabulary learning from viewing television. *International Journal of Applied Linguistics*. <https://doi.org/10.1075/itl.18034.rod>
- Shabani, M. B., Malmir, A., & Arjmand, F. (2018). The contribution of lexical, grammatical, and propositional knowledge preparation to L2 listening comprehension. *The Iranian Journal of Applied Language Studies (IJALS)*, 10(2), 175–208.
- Surmanov, S., & Azimova, M. (2020). Analysis of difficulties in vocabulary acquisition. *Journal of Legal Studies and Research*, 6(1), 144-153.
- Supraba, D., & Silvana, R. (2020). The effects of summarizing using infographics on EFL learners' reading comprehension. *Globish (An English-Indonesian Journal for English and Culture)*, 9 (2), 28-42.
<http://dx.doi.org/10.31000/globish.v7i2>
- Taghizadeh, M., & Zafarpour, S. (2022). Peer observation, reflection, and expert feedback: Pre-service EFL teachers' online teaching vocabulary to young learners. *Iranian Journal of Applied Language Studies*, 14(1), 19-46.
- Taj, I. H., Ali, F., Sipra, M. A., & Ahmad, W. (2017). Language learning on vocabulary acquisition of EFL learners. *International Journal of Applied Linguistics and English Literature*, 6(3), 262-272.
<http://dx.doi.org/10.7575/aiac.ijalel.v.6n.3p.262>
- Toth, C. (2013). Revising a genre: Teaching infographics in business and professional communication courses. *Business Communication Quarterly*, 76(4), 446-457.
- Yildirim, S. (2017). Approaches of designers in the developed educational purpose of infographics design processes. *European Journal of Education Studies*, 3(1), 248-284.
- Zahedi, Y., & Abdi, M. (2012). The effect of semantic mapping strategy on EFL learners' vocabulary learning. *Social and Behavioral Sciences*, 69, 2273-2280.
- Zarei, A. A., & Oruji, M. (2019). The effect of multimedia glosses on L2 listening comprehension. *Iranian Journal of Applied Language Studies*, 11(1), 201-220.