European Journal of Foreign Language Teaching
ISSN: 2537 - 1754
ISSN-L: 2537 - 1754
Available on-line at: www.oapub.org/edu

doi: 10.46827/ejfl.v6i4.4515 Volume 6 | Issue 4 | 2022

THE EFFECTS OF INFOGRAPHICS ON ENHANCING LANGUAGE LEARNING OUTCOMES AND MOTIVATION IN A JAPANESE EFL CONTEXT

Mengjiao Wu[1i],
Kaoru Kuwajima[2]
[1]Shanghai Maritime University,
Shanghai, China
[2]Meijo University,
Nagoya, Japan

Abstract:
The existent research details pedagogical benefits of infographics in enhancing communication, comprehension, learning, and motivation, while more research on the potential educational benefits of using infographics is needed regarding their application in second language acquisition. The aim of this study was specifically to investigate the effects of using infographics as a supplemental teaching tool in EFL classes with a focus on learning outcomes and English learning motivation. The study was conducted in two lower-intermediate English classes at a Japanese university. An infographic of the grammar points of simple past/past continuous was designed and applied as a supplement to the textbook-related content. One class was taught in a textbook-infographic order and the other vice versa. Participants' understanding of the target grammar points and English learning motivation were measured. The findings suggested that students were able to learn effectively using the provided infographics, but it is more effective to use infographics after the textbook teaching. Students showed higher English language learning motivation after the interventions and a high interest in using infographics in their English language course. Teaching advices on using infographics in EFL classes were discussed.

Keywords: EFL; motivation; infographics; visualization; teaching techniques

1. Introduction

An infographic, or "information graphic" is a visual representation of information, data or knowledge that blends data with design, enabling more effective and concise communication (Smiciklas, 2012; Alyahya, 2019). Ozdamli & Ozdal (2018) defined Infographics as graphic visual representations of data and information that facilitate the

[i] Correspondence: email mwu1808@gmail.com

delivery and understanding of complex information. Easy and widespread access to technology is now commonplace within education systems, and new formats of educational materials should be considered for improving students' performance and engagement. Infographics could stand out as an extremely useful medium in knowledge and information transfer in an educational context. The pedagogical benefits of infographics in enhancing communication, comprehension, learning, and motivation (Lankow, Ritchie, & Crooks, 2012) also have a huge potential in enhancing learners' learning performance and motivation in English as a second language learning. Additionally, given the motivational crisis exhibited in English education in Japan (Berwick & Ross, 1989; Ushioda, 2013), Japanese EFL learners might be able to benefit more from the motivation value of infographics. The current study explored the use of infographics in a Japanese college EFL context and investigated its impact on English language learning outcomes and motivation.

2. Literature Review

2.1 Infographics

Research suggests that the advantage of infographics is visualization (Thomas, 2012; Alyahya, 2019) because visual information transfers more rapidly and effectively than pure text in many cases as the phrase goes *"A picture is worth a thousand words*". There is a long history of using infographics such as icons, graphics, and pictures to convey information and knowledge to enhance communication and in the current society, visual information even becomes dominant (Damyanov & Tsankov, 2018).

Paivio's (1971) dual-coding theory supports the potential positive effect of infographics on learning performance. According to Paivio, information is processed and encoded along two channels in the mind, verbal and visual, and separate representations of the information are made in each channel. In studies on the effect of this theory, dual-coded information was found to be more likely to be recalled in a later memory test (Brunyé, Rapp, & Taylor, 2008). Infographics are hypothesized to achieve such dual-coding effects because by definition they combine visual data with limited word description. Thus, infographics can potentially help viewers to receive and comprehend complex information more readily and rapidly (Nhan & Yen, 2021).

Existing literature on infographics points to the agreement on their positive effect on facilitating interest and performance (Kos & Sims, 2014; Martix & Hodson, 2014; Vanichvasin, 2013). Lankow, Ritchie, and Crooks (2012) adopted a framework developed by Moere and Purchase (2011) which can be used to explain the value of infographics: *appeal, comprehension,* and *retention*. The researchers addressed the effect of images and graphics regarding appeal and encouraging engagement, and they expected that infographics would enhance comprehension through visualization to allow for immediately identifying notable patterns, trends, and outliers in the data. It is believed that the appealing feature of infographics supports their positive role in triggering

interest, and the comprehension and retention features explain their effect on learning performance.

There are reports on the important role infographics have come to play in representing information, illustrating concepts, relating numeric data, and promoting visual literacy skills in educational contexts (Krauss, 2012). In one noteworthy study, Vanichvasin (2013) sampled 20 undergraduate students in a knowledge management course and examined the effect of infographics in the classroom. The results revealed that infographics used as an educational tool enhanced *appeal*, *comprehension*, and *retention*, thereby enhancing the *effectiveness of communication*. Thus, infographics promoted satisfaction and contributed to improving the quality of learning in the classroom. Steyn, Botha, and Mennega (2018) conducted a study with 210 students taking the course System Analysis Design at a college in South Africa and found infographics to be an effective teaching tool to supplement the course contents. Dahmash (2017) found students' engagement in creating infographics in class seemed to have positive effects on the perception of infographics and learning enhancement. Damyanov and Tsankov (2018) argued infographics can be used as a modeling method to develop different cognitive skills. Infographics are also found to be an important teaching material in the early stage of education (Ozdamli & Ozdal, 2018) as well as effective in helping students overcome mathematical learning difficulties (Baglama et al., 2017).

Despite infographics' increasing popularity and potential in education, the effectiveness of using infographics as a tool for teaching and learning EFL has not been paid much attention until recently. One of the examples is Alrajhi's study (2020) with 78 Arabic learners at a Saudi university, which revealed the effectiveness of static infographics on learning English idioms. The results showed statistical significance in test performance when using static infographics for vocabulary learning among EFL students. Alrajhi (2020) also argued that infographics could be used as a learning tool to improve retention, motivation, interests, and positive attitudes toward learning. Alrajhi's study is indicative of the possibility of incorporating infographics into EFL setting, which is also where our study aimed at. Nhan and Yen (2021) explored the impact of using infographics in grammar teaching on motivation in Vietnam and suggested the use of infographics in grammar teaching could enhance students' motivation in learning English grammar and even improve students' learning performance. Rezaei and Sayadian (2015) found infographic instruction could help enhance Iranian EFL learners' grammatical knowledge compared with traditional teaching using the explicit definition.

Overall, the evidence demonstrates the potential of infographics to improve learning outcomes by facilitating information delivery as well as increasing visual literacy, interest, engagement, and positive attitude. However, the inadequate research addressing the effects of infographics on EFL learning suggested the need for additional studies, especially in the Japanese context, where scholars and educators addressed concerns towards students' lower English learning motivation (Berwick & Ross, 1989; Nakata, 2006; Ushioda, 2013).

2.2 Learning Motivation

Motivation has always been a frequent topic in the Japanese EFL context. English education in Japanese universities was described as a "*motivational wasteland*" by Berwick and Ross (1989, p.207) for presenting motivational crisis (Ushioda, 2013). Nakata (2006) reported a general consensus that Japanese English learners have low motivation and weak English communication competence. Ryan (2009) regarded the literature on EFL learning in Japan as "*a fascinating, though often depressing picture*" (p. 124), which motivated him to test the concept of the ideal L2 self in the Japanese educational setting. Ushioda (2013) addressed Japanese English education as "*grammar-focused 'English for exams' (juken eigo)*" (p. 5), and commented that "*demotivation is obviously viewed as a significant phenomenon in English language education in Japan*" (p. 6). A more recent case study on the English language learning motivation of four Japanese college students found students had a hard time motivating themselves to experience the language in their daily lives and were even negatively affected by the teacher and classmates (Kikuchi, 2019). All of these made it more meaningful and important to explore teaching interventions that can help motivate Japanese EFL learners and help them to achieve higher performance.

The motivation to learn is an important topic in education and psychology due to its importance in academic performance and professional lives. Various models of motivation have been developed to understand the role of motivation in academic performance. Cook and Artino Jr (2016) summarized five contemporary theories about learning motivation: expectancy-value theory (Wigfield & Eccles, 2002), attribution theory (Weiner, 1985), social cognitive theory (Zimmerman, 2000), goal orientation theory (Dweck & Leggett, 1988), and self-determination theory (Ryan & Deci, 2000), and clarified the key intersections and distinctions among the theories. According to their work, all these five theories contain a common concept about motivation, which is the belief in self-competence, or to say, self-efficacy. Most of them include a concept related to the value or expected results. Contemporary theories also recognize that motivation involves interaction between the individual and the social context, which could be presented by engagement and persistence. Thus, the current study included the three concepts of *self-efficacy*, *values,* and *engagement* when examining learning motivation.

It is believed that when learners are motivated to learn, the learning activities will go smoothly and continuously, and the learning objectives are more likely to be achieved (Sardiman, 2012). Learning motivation is also regarded as one of the principal individual difference variables that affect learning outcomes (Piniel, 2013), which led to numerous research interest in the role of motivation in learning and performance (Afzal et al., 2010; Froiland & Worrell, 2016). Many studies discussed various teaching interventions to increase learners' motivation and facilitate learning performance across ages and subjects (Chiang & Lee, 2016; Law, Geng, & Li, 2019; Su & Cheng, 2015; Tran, 2019).

Motivation has also attracted many scholars in the fields of applied linguistics and second language acquisition for its practical and concrete implications in the classroom (Dörnyei, 2020) and its important role in language learning success (Alizadeh, 2016).

Robert Gardner (1985; cited in Williams & Burden, 1997, p.116) defined language learning motivation as the effort and desire to achieve the language learning goal, together with the positive attitude towards language learning. Gardner, Lalonde, and Moorcroft (1985) demonstrated that "*attitude, motivation, and language aptitude are involved in second language learning*" (p. 225), and they can influence learning achievement by influencing the learning rate. Alizadeh (2016) reviewed previous research on the role of motivation in language learning and identified motivation as an important factor that predicts learners' EFL learning outcomes. Thus, learners' favorable attitudes towards the language they are learning are vital. Many ESL/EFL researchers strove to explore techniques and accesses to enhance language learners' motivation in order to help them achieve higher language learning proficiency. For example, Namaziandost et al. (2019) attempted to improve Iranian EFL learners' oral proficiency and English learning motivation by applying cooperative learning instructional activities, and the results showed enhancement in both speaking skills and intrinsic motivation. Park and Wu (2020) argued that Instagram, a social networking site could be used as a teaching tool in Japanese EFL classes to motivate students and improve their long-term English language proficiency, grammar and vocabulary skills in specific. Wichadee and Pattanapichet (2018) tried to increase students' language learning motivation and performance by using the digital game Kahoot in an English language college course in Thailand. Shelton-Strong and Mynard (2021) successfully promoted positive emotions and English learning motivation by asking students to keep a confidence-building diary at a university in Japan.

Interest, as one of the motivation constructs, is believed to develop from one's interaction with the environment (Krapp, 1999). It is broadly defined as a psychological state, a desire to reengage with an object, event, or idea (Fryer, Shum, Lee, & Lau, 2021; Renninger & Hidi, 2016). Hidi and Renninger (2006) developed a four-phase model of interest development to better understand the concept of interest and its development. In their model, interest is first triggered as an affective experience from the engagement with an object in the environment (*triggered situational interest*). With repeated engagement, the triggered situational interest develops into *maintained situational interest*, and then *emerging individual interest*, a more stable state. Further engagement finally leads to *well-developed individual interest* accompanied by adequate knowledge of the object and strong personal connection. This final state of interest is relatively enduring. This model helps to explain how the environment can influence the emergence and development of interest after interaction with the object. The main contribution of the model is the notion that interest can be developed through intervention, with the implication in the real-life educational setting that if educators can identify, support, and facilitate the development of interest, then learning can be improved.

Additionally, the role of interest in learning and education has been increasingly studied. Hidi and Renninger (2006) recognized the powerful influence of interest on learning owing to its impact on attention, goals, and levels of learning after looking into earlier studies. Since then, the research topic of interest has continuously attracted the attention of recent researchers, especially in the language teaching and learning field.

Therefore, we proposed for this study that infographics can serve as an intervention to trigger and help maintain situational interest and facilitate the development of interest. Thus, *interest* is also included as one motivational concept in the current study.

2.3 This Study

For this study, we used infographics as a supplemental teaching tool in college EFL classes in Japan to explain grammar points rather than as an assignment as in earlier research. We proposed that infographics could have positive effects on students' language learning through their advantages in *effective communication*, *information delivery*, *comprehension*, and *retention*, and infographics would trigger students' interest and engagement in language learning due to the innate appeal of visualization. Finally, we anticipated that the learners would show improved learning outcomes along with their increased situational interest and even language learning motivation.

Therefore, the current study was to answer the following research questions:

1) Can infographics be used to enhance language learning performance?

2) Does the supplement of infographics increase students' English language learning motivation?

3. Methods

3.1 Participants

This experimental study was conducted in a mandatory college English course at a private university in Japan. The study was carried out with two intact business-major classes in a fall semester. Class 1 had 28 students (16 male; mean age = 19.32), and Class 2 had 24 students (18 male; mean age = 19.53). All students were assigned to the classes randomly at the beginning of the semester. All students were at the university sophomore level and fell within the lower-intermediate English proficiency range. Both classes were required to attend the class 90 mins each time, twice a week for 15 weeks in that semester.

3.2 Research Materials

a. Textbook

For this experiment, the textbook, *Four Corners Level 3*, published by Cambridge University Press was used. The grammar points of *simple past/past continuous* in Unit 2 were selected as the target grammar points for this experiment based on a grammar diagnosis test placed at the beginning of the semester. That grammar diagnosis test showed that participating classes had a low understanding of *simple past/past continuous*. The instructor also agreed with this selection based on her teaching experience, where she found, some students did not seem to understand how to use simple past and past continuous in their writing.

b. Tests

Grammar tests examining students' understanding and use of simple past/past continuous were given four times throughout the experiment: pretest, posttest 1, posttest 2, and delayed posttest. The pretest was placed before the teaching. Then the target grammar points were taught in two separate sessions in two different weeks. After each session, there was a post-test (posttest 1 and posttest 2) to examine participants' immediate learning gains. The delayed posttest was given 1 week after learning to examine the long-term learning effect.

Each test contained 24 blank-filling questions, 12 for the target grammar questions and an equivalent number of dummy questions. The target grammar questions in the tests were adopted from the *Four Corners* teachers' toolkit. In the test, participants were asked to complete the conversation with the words in parentheses by using the correct simple past or past continuous form of the verbs. An example of the target grammar questions is presented as follows:

Directions: Complete the conversation with the words in parentheses. Use the correct simple past or past continuous form of the verbs.
A: What _____ (you / do) when _____ (the lights / go out)?
B: _____ (we / watch) the drama on TV.

The target grammar questions in the following posttests were modified to look different from the ones in the prior test but still set to examine the understanding and use of the same grammar points. For example, "watch the drama on TV" from the example question would be replaced with "chat with a friend on the phone". The dummy questions were irrelevant grammar questions and were included to distract students from the target grammar, reducing the possibility that participants would copy their answers from a prior test.

The test scores were calculated only based on the target grammar questions to reflect students' comprehension of the target grammar points. It was 1 point for each target grammar blank-filling, making the full score 12 points for each test.

c. Surveys

Two surveys were used: an English language learning motivation survey (see Appendix A) and an infographics attitude survey (see Appendix B). The English language learning motivation survey was selected from the motivation section in Motivation Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991) based on their relevance to the course and local educational context. The motivation section of MSLQ is a commonly used self-report instrument designed to assess students' motivational orientations for a course in the college context. The English language learning motivation survey used in this study contained 11 statements to measure students' overall attitudes toward English learning regarding four aspects of English language learning motivation: interest (1 item; e.g., "I am interested in English."), self-efficacy (4 items; e.g., "I believe I can learn English

well.", expectancy, values (2 items; e.g., "I think English is important."), and engagement (4 items; e.g., "I will continue learning English in the future.". The English language learning motivation survey was administered before and after the experiment to measure any changes in participants' attitudes toward learning English after teaching interventions.

The infographics attitude survey contained 12 statements and one yes-no question (see Appendix B). The 12 statements were used to measure students' attitudes toward using infographics in English language learning in relation to four aspects: interest (3 items; e.g., "I am interested in infographics."), value (5 items; e.g., "I think infographics are useful for my English learning."), ease of use (2 items; e.g., "I find infographics easy to use."), and engagement (2 items; e.g., "I would like to use infographics for English learning in the future.". The yes-no question, the 13th question was "If the teacher were to continue providing infographics for your future English grammar learning, would you like to sign up for them?" The yes-no question was used to measure the likelihood that students would want to use infographics in future grammar lessons from a behavior perspective.

The items on both the English language learning motivation survey and infographics attitude survey were rated on 6-point Likert scales, allowing participants to rate "1" to "6" to indicate whether the statement fitted their situations. Both surveys were translated and presented in Japanese when they were given to the participants. The Japanese survey Likert scale item ratings were reverse ordered to accommodate the Japanese rating conduct. Specifically, "1" was highly positive and "6" were highly negative; the lower the rating, the more positive the attitude (see the Japanese version in Appendix A_J and Appendix B_J).

3.3 Procedures

Before the experiment began, participants in both classes were briefly informed about the experiment, and then they completed the consent form. A grammar pretest was administered to measure the participants' understanding of the target grammar points and then a pre-survey to measure their interests in English language learning.

The experiment was completed in 3 weeks. In the first two weeks, both classes received two separate teaching sessions on the target grammar points, one session each week. All the teaching sessions were given by the same Japanese instructor. After each teaching session, the participants were given an immediate grammar posttest (posttest 1 and posttest 2). In the third week, both classes were given the delayed grammar posttest, the post-survey on English language learning motivation and the infographics attitude survey.

Class 1 was taught the target grammar points, simple past/past continuous, using the textbook in the first week and then using infographics in the second week (textbook–infg), whereas Class 2 was taught using infographics in the first week and then using the textbook in the second week (infg–textbook). Figure 1 illustrates the experimental procedure.

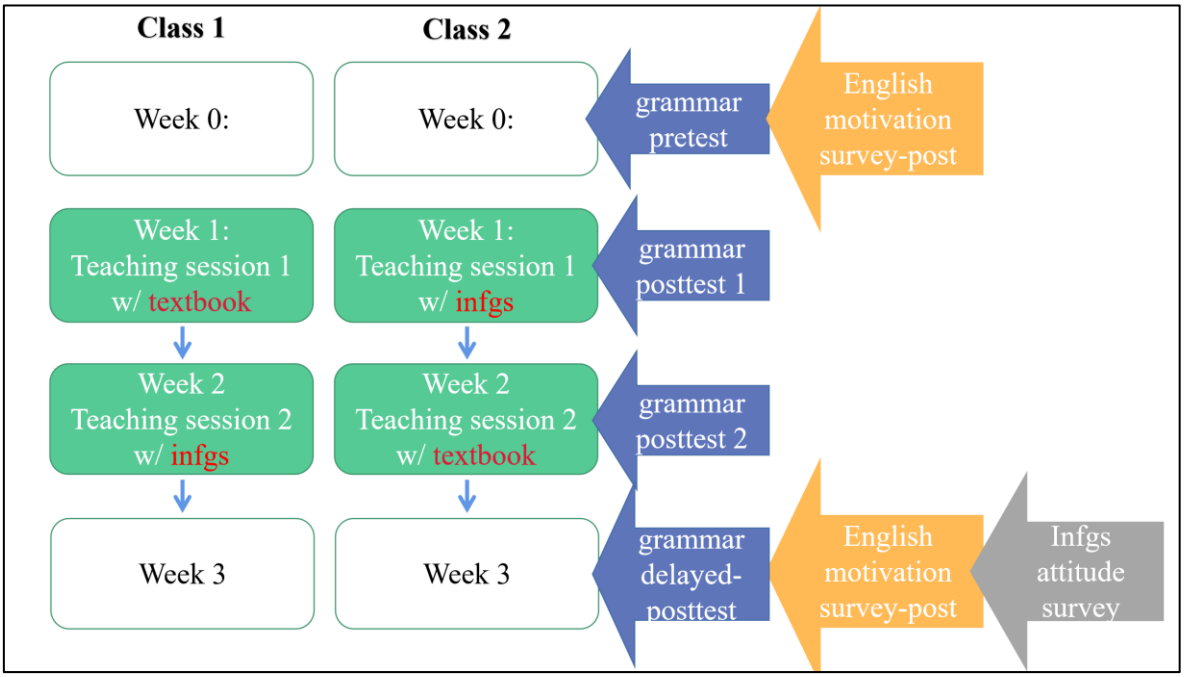
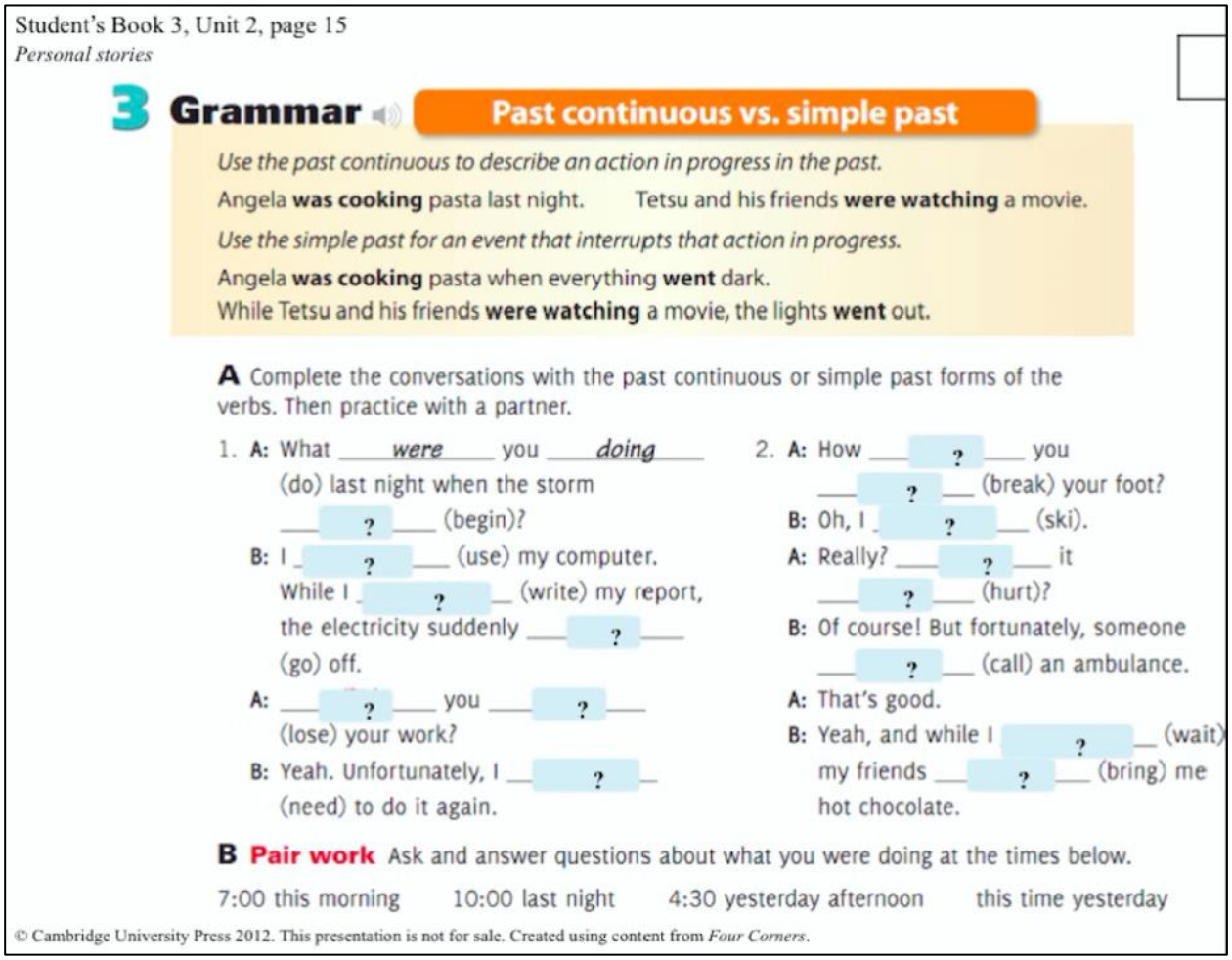


Figure 1: Experiment procedure

3.4 Teaching Procedure

a. Textbook Teaching

Textbook teaching means teaching grammar points using the written explanation and sentence examples presented in the selected textbook, *Four Corners 3* (see Figure 2 for the textbook page copy). First, the instructor explained the grammar points of *simple past/past continuous* for 10 mins following the textbook instruction procedure. The students then completed a fill-in-the-blank exercise taken from the textbook for approximately 5 mins, and the answers were checked and explained. The instructor then led a vocabulary exercise for approximately 7 mins to take the students' minds off the target grammar points before giving the posttest.



Student's Book 3, Unit 2, page 15
Personal stories

3 Grammar **Past continuous vs. simple past**

Use the past continuous to describe an action in progress in the past.

Angela **was cooking** pasta last night. Tetsu and his friends **were watching** a movie.

Use the simple past for an event that interrupts that action in progress.

Angela **was cooking** pasta when everything **went** dark.
While Tetsu and his friends **were watching** a movie, the lights **went** out.

A Complete the conversations with the past continuous or simple past forms of the verbs. Then practice with a partner.

1. A: What ___*were*___ you ___*doing*___ (do) last night when the storm ___?___ (begin)?
   B: I ___?___ (use) my computer. While I ___?___ (write) my report, the electricity suddenly ___?___ (go) off.
   A: ___?___ you ___?___ (lose) your work?
   B: Yeah. Unfortunately, I ___?___ (need) to do it again.

2. A: How ___?___ you ___?___ (break) your foot?
   B: Oh, I ___?___ (ski).
   A: Really? ___?___ it ___?___ (hurt)?
   B: Of course! But fortunately, someone ___?___ (call) an ambulance.
   A: That's good.
   B: Yeah, and while I ___?___ (wait) my friends ___?___ (bring) me hot chocolate.

B Pair work Ask and answer questions about what you were doing at the times below.

7:00 this morning 10:00 last night 4:30 yesterday afternoon this time yesterday

Figure 2: Textbook copy on simple past/past continuous in *Four Corners 3*

b. Teaching with Infographics

Teaching with infographics means explaining the grammar points using infographics instead of written explanations. An infographic explaining the target grammar points, simple past/past continuous was created, printed out, and used as a student handout (see Figure 3). The instructor explained the grammar points using the infographic together with the example sentences for approximately 10 mins. Then, the instructor handed students the exercise sheet containing the other half of the fill-in-the-blank exercise, and then checked and explained the answers. A different vocabulary exercise (around 7 mins) was used to take students' minds off the target grammar points before giving the posttest.

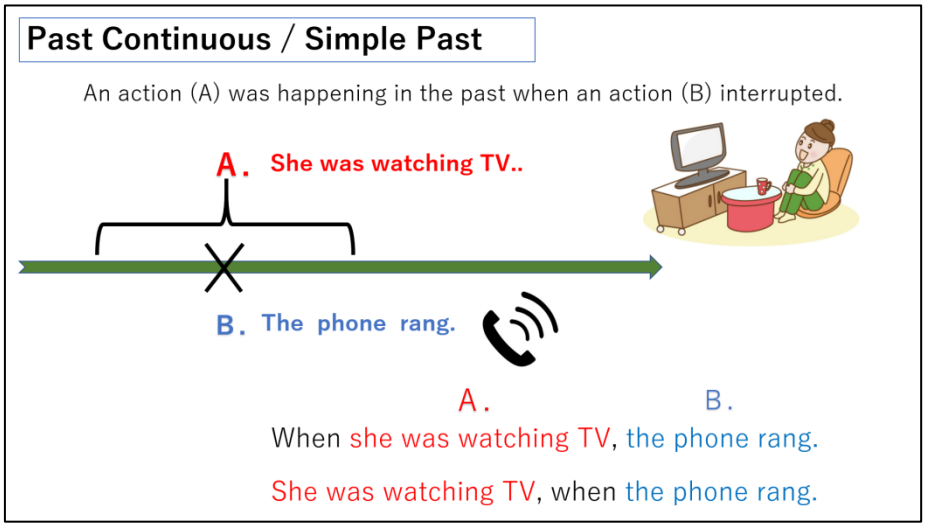


Figure 3: The infographics used to teach past continuous vs. simple past

4. Results

4.1 Test Scores

The full test score for each of the four grammar tests (pretest, posttest 1, posttest 2, and delayed posttest) was 12. Class 1 was taught the target grammar points in the textbook–infg order, while Class 2 was taught the same grammar points in the infg–textbook order. The mean test scores in each test for both classes are presented in Table 1 and Figure 4.

Table 1: Mean test scores: Class 1 and Class 2

	Class 1 (txtbk–infg)			Class 2 (infg–txtbk)		
	n	***M***	***SD***	***n***	***M***	***SD***
Pretest	24	3.17	3.46	16	4.13	2.50
Posttest 1	25	9.12	2.54	19	5.52	2.67
Posttest 2	22	9.59	2.59	14	7.57	1.82
Delayed posttest	20	9.10	2.63	20	6.70	3.54

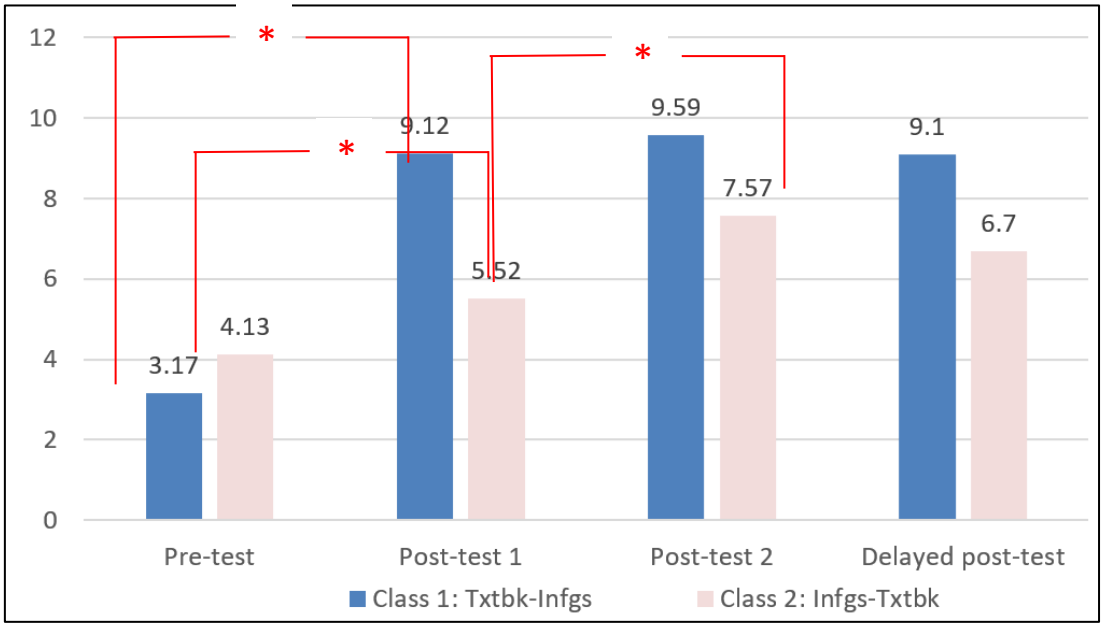


Figure 4: Mean test scores for Class 1 and Class 2

A. Within-subject Effects

A repeated measures ANOVA was run to examine the effects of teaching interventions in Class 1. Data from the participants who missed more than one test was excluded. The findings for Class 1 were significant, $F(3, 42) = 17.44$, $MSe = 5.80$, $p < .001$, indicating significant teaching effects. The increase in the mean score from the pretest to posttest 1 was significant, $F(1, 14) = 16.00$, $MSe = 17.07$, $p = .001$, but the score differences between posttest 1 and posttest 2 and between posttest 2 and the delayed posttest were not significant (see Figure 4). These findings indicate that teaching grammar with a textbook was effective but further teaching using the infographic did not result in further significant gains for Class 1. Participants' long-term learning gain (delayed posttest) remained the same as the immediate learning gain (posttest 2).

Another repeated measures ANOVA checked the effects of the teaching interventions in Class 2, and the model was also significant, $F(3, 24) = 12.24$, $MSe = 3.24$, $p < .001$. The score differences were significant between the pretest and posttest 1, $F(1, 8) = 20.16$, $MSe = 27.56$, $p = .002$, and between posttest 1 and posttest 2, $F(1, 8) = 7.84$, $MSe = 2.78$, $p = .023$. However, the score difference was not significant between posttest 2 and the delayed posttest (see Figure 4). Thus, it can be inferred that the first infographics teaching intervention effectively increased Class 2's knowledge of the target grammar points, and the textbook teaching afterwards further improved the participants' learning gain. In this case, teaching using a textbook and an infographic both supported effective learning. Participants' long-term learning gain (delayed posttest) was well maintained one week after teaching interventions ended.

B. Between-subject Effects

Independent-samples t-tests were used to examine the test scores differences between Class 1 and Class 2 (see Figure 5). Class 1's mean pretest score was 3.17, and Class 2's

mean pretest score was 4.12. No significant difference was found. The absence of a significant group difference in the pretest scores between Class 1 and Class 2 indicated that the two classes started with similar knowledge of the target grammar points. After the first teaching intervention (Class 1: textbook; Class 2: infg), Class 1's mean score on posttest 1 was 9.12, which was significantly higher than Class 2's mean score of 5.52, $t(42) = 4.55$, $p < .001$. After the second teaching intervention (Class 1: infg; Class 2: textbook), Class 1's mean posttest 2 score was 9.59, which was also significantly higher than Class 2's mean score 7.57, $t(34) = 2.53$, $p = .016$, and Class 1's mean score on the delayed posttest was also higher than Class 2's mean score ($M = 9.10$ vs. $M = 6.70$, $t(38) = 2.43$, $p = .02$). That is, Class 1 outperformed Class 2 in all posttest (posttest 1, posttest 2, and the delayed posttest).

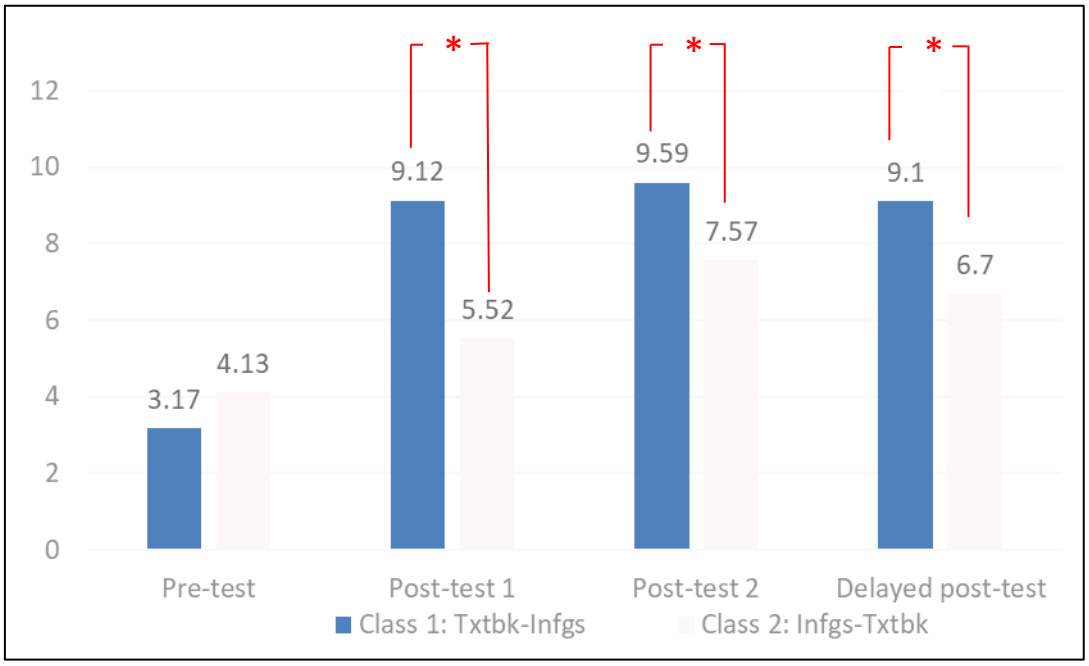


Figure 5: Test scores in pretest, posttest 1, posttest 2, and delayed posttest of Class 1 and Class 2

4.2 Motivation

The English language learning motivation survey was administered before and after the experiment. Participants rated their attitudes towards the statements on 6-point Likert scales ranging from 1 (*highly positive*) to 6 (*highly negative*) in the Japanese style, but for the data analysis, the scores were recoded according to the western style model, that is, 6 = *highly positive* and 1 = *highly negative*.

Even if the two classes received teaching using infographics in different orders, they both experienced infographics used as a supplemental tool in learning grammar, therefore, the analysis of the results of English language learning motivation surveys grouped both classes. There were thirty-one valid data (17 from Class 1 and 14 from Class 2) after excluding the participants that didn't complete both pre and post-English language learning motivation surveys. Figure 6 illustrates the numerical increase in the ratings on each statement after the experiment. The overall mean rating for the English

language learning motivation survey was 3.92 (SD = .68) out of 6 before the experiment, and it was increased to 4.19 (SD = .60) after the experiment among the valid participants. A paired sample t-test showed the increase was significant, t(30) = -3.4, p = .002. This means participants developed a stronger interest in English language learning after the experiment.

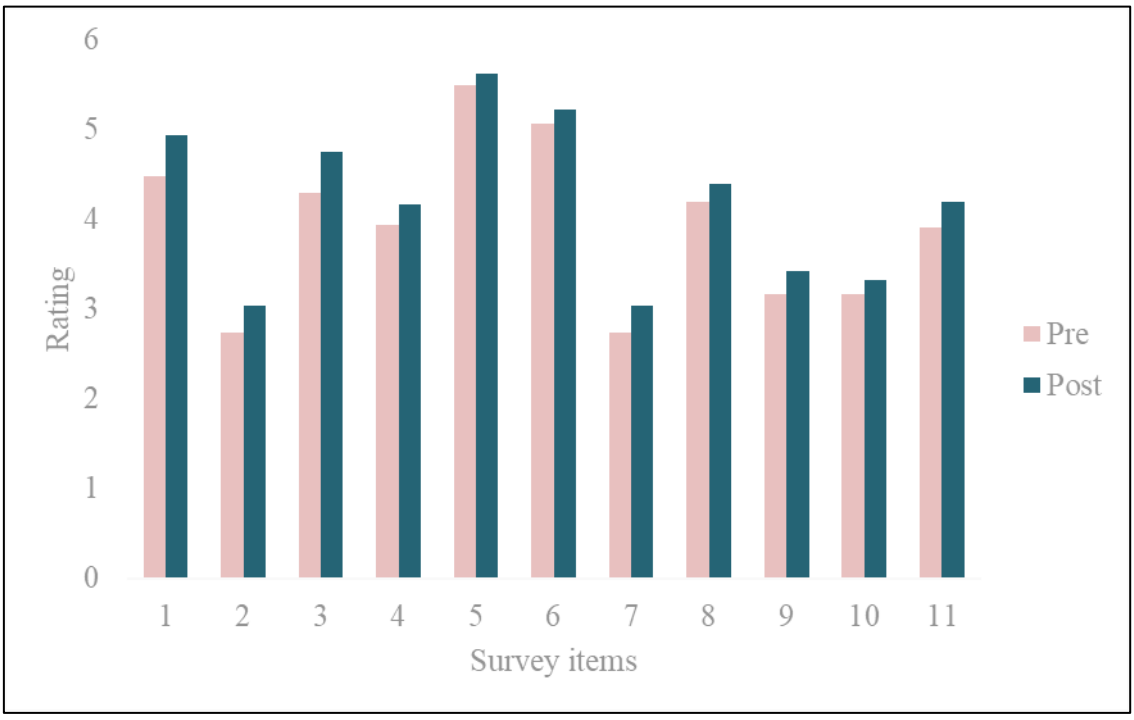


Figure 6: The ratings on each item in the English language motivation before and after the experiment

The infographics attitude survey was used to examine the participants' attitudes toward using infographics as a supplement to the textbook in English learning. Forty-two valid infographics attitude surveys were retrieved (23 from Class 1 and 19 from Class 2). On the 6-point Likert scale, the participants' overall mean rating for using infographics in English learning was 4.58 (SD = .81, n = 42), which indicated a high attitude towards the use of infographics as a language learning tool. The overall ratings reflected the participants' positive attitudes toward using infographics in English teaching. The participants were also asked in the infographics attitude survey if they would like to sign up for receiving more infographics for language learning in the future. Among the 42 valid returns, 33 chose to sign up, which was 78.57% of the valid returns.

Overall, the current study showed that using infographics as a supplemental tool in EFL teaching had a positive effect on learning outcomes and English language learning motivation. The students also showed high interest in using infographics in their language class and interest in keeping using infographics in future EFL learning.

5. Discussion

The aim of this study was to investigate the effects of using infographics as a supplemental teaching tool in EFL grammar teaching. The study was carried out in a private Japanese university. It was hypothesized that a graphic display could facilitate the target grammar comprehension, support the encoding and retention of the knowledge, and thereby improve the grammar learning outcomes. It was also expected that infographics would stimulate higher language learning motivation and interest among learners.

According to the analysis results, both classes showed significantly improved understanding of the target grammar points after the first teaching intervention using either an infographic or the textbook. This means teaching grammar using an infographic or textbook (written explanation) is both effective. However, Class 1 (textbook first, M = 9.12) scored significantly higher than Class 2 (infg first, M = 5.52) after the first teaching intervention. That means teaching grammar using the textbook alone generated higher learning gains than using an infographic alone. Thus, textbook (written explanation) teaching is more efficient than infographic teaching. What's more, Class 1 (textbook-infg) continued scoring higher in posttest 2 and the delayed posttest (a week later) than Class 2 (infg-textbook). The initial suggestion will be that when infographics are used as a teaching supplement to the textbook, textbook-infg teaching order is more effective than infg-textbook order.

However, considering the facts that the two participating classes were at the same English proficiency level, both classes started the experiment with a similar understanding of the target grammar points, and both received textbook and infg teaching interventions, the current result that Class 1 achieved higher in all the tests deserves more discussion. The written explanation of grammar points from the textbook seemed to be very effective when used to introduce a new grammar point to college students. Our assumption is, textbook teaching covers the grammar points in a more logical way, and this might better suit college students' cognitive and learning competences. Class 2 was able to achieve higher in the posttest 2 than posttest 1 after receiving the second teaching session using textbook, but Class 2 still performed lower than Class 1 in both posttest 2 and delayed posttest. It seems teaching using infgs first suppressed the effect of textbook teaching, and this suppressing effect lasted in the long run as reflected in the delayed posttest. This appears that the initial teaching technique and learning experience is critical and the impact (positive or negative) of the first learning experience could not be easily replaced by the later one. It also indicates that teaching order matters when different teaching approaches or techniques are applied.

It is also noticed that Class 1's test score didn't increase significantly from the first teaching intervention (M= 9.12 in posttest 1) to the second (M = 9.59 in posttest 2). One explanation is that the infographics teaching was not able to help the participants to learn more after what the prior textbook teaching had achieved. It could also be explained by

the ceiling effect as the full score of the tests was 12 points and additional teaching was not able to generate more learning.

All in all, the results showed both infographics and textbook teaching are effective, but it is also suggested that textbook teaching is more efficient when used alone and textbook-infg teaching order is more effective in both the short term and long term. Then here is the follow-up question: Is infographics teaching redundant or needed? The current study also revealed additional benefits of using infographics as a supplement to textbook teaching. It is observed that the learners showed increased motivation in English language learning, high interest in infographics, and high willingness to use infographics in future grammar classes. The experiment lasted for only 4 weeks with the teaching interventions carried out in only 2 weeks. The observed significant increase in participants' English language motivation over such a relatively short period is worth noticing. This can justify the benefits of involving infographics in regular textbook grammar teaching which commonly uses written explanations to explain grammar to boost learners' interest and learning motivation. The increased English language learning motivation may further stimulate students' learning interest and generate positive learning outcomes. On the other hand, the use of the infographic might have also helped with the retention of the target grammar points and supported the observed sustaining long-term learning gains in this experiment. The fact that the participants were interested in the provided infographic handout and were observed to well keep it indicated extra benefits of using infographic handouts in class. The infographic handout could have made it easier and more attractive for the participants to review the knowledge compared to the written explanation in the textbook.

The current study was limited in a couple of ways. One of the limitations is that there lacked a control group receiving textbook teaching only. The purpose of the study was to examine the effect of using infographics as a supplemental tool to the textbook in teaching grammar, thus infographics teaching was always attached to textbook teaching. Both participating classes received textbooks and infographics teaching interventions on the same target grammar points in different orders. This setting also guaranteed the participants equal learning opportunities. However, it would help to have a control group that receives textbook teaching alone to examine if the currently observed positive effect on English language learning motivation was caused by the use of the infographic. This can be the focus of the follow-up studies. Additionally, the current study focused on the grammar points of simple past/past continuous. The effectiveness of teaching other grammar points using infographics needs to be examined to generalize the effect of teaching grammar using infographics. The current experiment was also limited to the population of two business-major classes in a Japanese private university. The findings need to be confirmed with a larger and more diverse sample size before any broader application. At this early stage, the observed positive effects deserve further examination and more interest and attention from the academic and pedagogical spheres.

After all, infographics are found to be an effective tool in teaching grammar points in EFL classes. However, this study did not find infographics to be more effective than

textbooks, so infographics are not promoted to replace textbooks. Instead, the current results suggest that infographics can be used as effective supplements after textbooks to effectively present and deliver certain grammar points, increase the diversity of grammar and language teaching materials, attract learners' attention, and stimulate learners' language learning motivation.

7. Conclusions

Graphic displays of information are all around us in our daily lives. Infographics are considered to better attract attention and facilitate comprehension in previous research. This study attempted to investigate the effects of infographics on second language acquisition in an EFL setting, specifically, aiming to identify whether infographics as a supplemental tool would improve grammar learning and English language learning motivation among Japanese EFL university students. In this study, the results supported the effectiveness of using infographics in teaching English grammar, but also showed textbook teaching is more effective and infographics are better used after textbook teaching. The EFL college students in this study showed high interest in using infographics in English grammar learning and higher English language learning motivation after infographics are added to the existing textbook teaching.

7.1 Pedagogical Implications and Teaching Techniques

The current study found that teaching English grammar points using infographics is effective and interesting to learners. This finding can be applied to facilitate the development of textbooks and the planning of classroom teaching materials and activities. Infographics can be put into a variety of applications, such as classwork, homework, handouts, notes, and exam preparation. Infographics are easy to obtain online or to create. Based on the teaching experiences from this study, some tips for incorporating infographics into language and grammar instruction are offered to instructors:

It is important to keep in mind that the purpose of using infographics is not the graphics themselves but to improve students' comprehension. Instructors are encouraged to tailor their infographics to their target grammar points and to make modifications based on students' feedbacks. There are also vast arrays of options available online (for instance, through a Google image or Pinterest search). Instructors are suggested to keep a running collection of infographics. It can take time to find infographics with good design, so it is valuable to compile and reuse those that work for the purposes. It is also suggested to exchange and share effective infographics with interested others to expand the collections. Sometimes, instructors can even encourage students to join the grammar infographics design. This can be a fun activity to help strengthen students' understanding of the target grammar points.

Instructors are encouraged to present infographics in the form of handouts or other compact displays that are easy to refer to. These tools should supplement and

reinforce the textbook and be convenient to use. For instance, researchers have observed students quickly lose paper handouts but maintain engagement with a laminated infographic tool.

Last but not least, do not fully rely on infographics for pedagogy. Some grammar points are not easily explained visually, and not all students are equally adept with visual learning. All supplemental tools are only effective if they meet the needs of the teacher/students using them.

Acknowledgement
Special thanks go to Nadeen Katz, an English language instructor with creative ideas and great passion for her continuous support.

Funding Statement
No funding was received to assist with the preparation of this manuscript.

Conflict of Interest Statement
The authors declare no conflicts of interest.

Acknowledgement
Mengjiao Wu is the corresponding author.

About the Authors
Mengjiao Wu, Shanghai Maritime University, China**.** Address: 1550 Haigang Avenue, Shanghai, China, 201306**.** Mengjiao Wu (PhD in Educational Psychology, Kent State University, USA, 2018) is an assistant professor at the College of Foreign Languages, Shanghai Maritime University, China. Her research focuses on linguistic cognitive development and its application, metacognition, second language acquisition, and EFL teaching methodology. orcid.org/0000-0002-7829-792X.
Kaoru Kuwajima, Meijo University, Japan**.** Address: 1-501 Shiogamaguchi, Tempaku-ku, Nagoya 468-8502, Japan. Kaoru Kuwajima (PhD in Cultural Anthropology, University of Tokyo, Japan, 2012) is an associate professor, and a head of the English Courses of the Faculty of Business & Management at Meijo University, Nagoya, Japan. Her research focuses on communicative English languages and cross-cultural studies. orcid.org/0000-0003-4588-0550.

References

Afzal, H., Ali, I., Khan, M. A., and Hamid, K. (2010). A study of university students' motivation and its relationship with their academic performance. *International Journal of Business and Management, 5*(4), 80-89.

Alizadeh, M. (2016). The impact of motivation on English language learning. *International Journal of Research in English Education, 1*(1), 11-15.

Alrajhi, A. S. (2020). Static infographics effects the receptive knowledge of idiomatic expressions. *Indones. J. Appl. Linguist, 10*(2), 315-326.

Alyahya, D. M. (2019). Infographics as a learning tool in higher education: The design process and perception of an instructional designer. *International Journal of Learning, Teaching and Educational Research, 18*(1), 1-15. https://doi.org/10.26803/ijlter.18.1.1

Baglama, B., Yucesoy, Y., Uzunboylu, H., & Özcan, D. (2017). Can infographics facilitate the learning of individuals with mathematical learning difficulties. *International Journal of Cognitive Research in Science, Engineering and Education, 5*(2), 119-128.

Berwick, R., & Ross, S. (1989). Motivation after matriculation: Are Japanese learners of English still alive after exam hell. *JALT journal, 11*(2), 193-210.

Brunyé, T. T., Rapp, D. N., & Taylor, H. A. (2008). Representational flexibility and specificity following spatial descriptions of real-world environments. *Cognition*, *108*(2), 418–443. https://doi.org/10.1016/j.cognition.2008.03.005

Chiang, C. L., & Lee, H. (2016). The effect of project-based learning on learning motivation and problem-solving ability of vocational high school students. *International Journal of Information and Education Technology, 6*(9), 709-712.

Cook, D. A., & Artino Jr, A. R. (2016). Motivation to learn: an overview of contemporary theories. *Medical education, 50*(10), 997-1014.

Dahmash, A. B., et al. (2017). Using infographics in the teaching of linguistics. *Arab World English Journal (AWEJ), 8*(4), pp. 430-443. https://dx.doi.org/10.2139/ssrn.3094545

Damyanov, I. & Tsankov, N. (2018). The role of infographics for the development of skills for cognitive modeling in education. *International Journal of Emerging Technologies in Learning, 13*(1), 82-92. https://doi.org/10.3991/ijet.v13i01.7541

Dörnyei, Z. (2020). *Innovations and challenges in language learning motivation*. Routledge.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*(2), 256.

Froiland, J. M., & Worrell, F. C. (2016). Intrinsic motivation, learning goals, engagement, and achievement in a diverse high school. *Psychology in the Schools, 53*(3), 321-336.

Fryer, L. K., Shum, A., Lee, A., & Lau, P. (2021). Mapping students' interest in a new domain: Connecting prior knowledge, interest, and self-efficacy with interesting tasks and a lasting desire to reengage. *Learning and Instruction, 75*, 101493. https://doi.org/10.1016/j.learninstruc.2021.101493

Gardner, R. C., Lalonde, R. N., & Moorcroft, R. (1985). The role of attitudes and motivation in second language learning: Correlational and experimental considerations. *Language learning, 35*(2), 207-227.

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational psychologist*, *41*(2), 111-127.

Kikuchi, K. (2019). Motivation and demotivation over two years: A case study of English language learners in Japan. *Studies in Second Language Learning and Teaching, 9*(1), 157-175.

Kos, B. A., & Sims, E. (2014). Infographics: The New 5-Paragraph Essay. *Proceedings of the 2014 Rocky Mountain Celebration of Women in Computing.* Laramie, WY, USA: University of Colorado.

Krapp, A. (1999). Interest, motivation and learning: An educational-psychological perspective. *European Journal of Psychology of Education, 14*(1), 23–40.

Krauss, J. (2012). Infographics: More than Words Can Say. *Learning & leading with Technology*, *39*(5), 10-14.

Lankow, J., Ritchie, J., & Crooks, R. (2012). *Infographics: The power of visual storytelling*. John Wiley & Sons.

Law, K. M., Geng, S., & Li, T. (2019). Student enrollment, motivation and learning performance in a blended learning environment: The mediating effects of social, teaching, and cognitive presence. *Computers & Education, 136*, 1-12.

Martix, S., & Hodson, J. (2014). Teaching with infographics: Practising new digital competencies and visual literacies. *Journal of Pedagogic Development*. Retrieved from https://www.researchgate.net/publication/293172863_Teaching_with_Infographics_Practicing_New_Digital_Competencies_and_Visual_Literacies

Moere, A. V., & Purchase, H. (2011). On the role of design in information visualization. *Information Visualization*, *10*(4), 356–371. https://doi.org/10.1177/1473871611415996

Nakata, Y. (2006). *Motivation and Experience in Foreign Language learning.* Bern: Peter Lang.

Namaziandost, E., Neisi, L., Kheryadi, & Nasri, M. (2019). Enhancing oral proficiency through cooperative learning among intermediate EFL learners: English learning motivation in focus. *Cogent Education, 6*(1), 1683933.

Nhan, L. K., & Yen, P. H. (2021). The impact of Using infographics to teach grammar on EFL students' learning motivation. *European Journal of Foreign Language Teaching, 5*(5), 85–99. https://doi.org/10.46827/ejfl.v5i5.3919

Ozdamli, F. & Ozdal, H. (2018). Developing an instructional design for the design of infographics and the evaluation of infographic usage in teaching based on teacher and student opinions. *EURASIA Journal of Mathematics, Science and Technology Education, 14*(4), pp. 1197- 1219. https://doi.org/10.29333/ejmste/81868

Paivio, A. (1971). *Imagery and verbal processes*. New York, NY: Holt, Rinehart & Winston.

Park, S., & Wu, M. (2020). Instagram as a Learning and Motivational Tool for Freshmen English Classes at a Private Japanese University. *The Asian EFL Journal, 24*(5), 64-107.

Piniel, K. (2013). L2 motivation, anxiety and self-efficacy: The interrelationship of individual variables in the secondary school context. *Studies in second language learning and teaching, 3*(4), 523-550.

Pintrich, P. R., Smith, D., Garcia, T. and McKeachie, W. (1991) *A manual for the use of the Motivated Strategies for Learning Questionaire (MSLQ)*. Ann Arbor, MI: University of

Michigan, National Center for Research to Improve Postsecondary Teaching and Learning.

Renninger, K. A., & Hidi, S. (2016). *The power of interest for motivation and engagement*. Routledge.

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.

Ryan, S. (2009). 'Self and identity in L2 motivation in Japan. The ideal L2 self and Japanese learners of English' in Z. Do¨rnyei and E. Ushioda (eds): *Motivation, Language Identity and the L2 Self. Multilingual Matters*, pp. 120–43.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist, 55*(1), 68.

Sardiman. (2012). *Teaching and Learning Interaction & Motivation.* Jakarta: Rajawali Pers.

Shelton-Strong, S. J., & Mynard, J. (2021). Promoting positive feelings and motivation for language learning: the role of a confidence-building diary. *Innovation in Language Learning and Teaching, 15*(5), 458-472.

Smiciklas, M. (2012). *The power of infographics: Using pictures to communicate and connect with your audiences*. Que Publishing.

Steyn, R., Botha, A., & Mennega, N. (2018). Is a picture truly worth a thousand words? infographics for undergraduate teaching. *In International Symposium on Emerging Technologies for Education* (pp. 69-78). Springer, Cham.

Su, C. H., & Cheng, C. H. (2015). A mobile gamification learning system for improving learning motivation and achievements. *Journal of Computer Assisted Learning, 31*(3), 268-286.

Tran, V. D. (2019). Does Cooperative Learning Increase Students' Motivation in Learning?. *International Journal of Higher Education, 8*(5), 12-20.

Thomas, L. C. (2012). Think visual. *Journal of Web Librarianship*, *6*(4), 321–324. https://doi.org/10.1080/19322909.2012.729388

Ushioda, E. (2013). Foreign motivation research in Japan: An 'insider' perspective from outside Japan. In M. Apple, D. Da Silva, & T. Fellner (Eds.), *Language learning motivation in Japan* (pp. 1-14). Bristol: Multilingual Matters.

Vanichvasin, P. (2013). Enhancing the quality of learning through the use of infographics as visual communication tool and learning tool. In *Proceedings of the ICQA 2013 International*.

Wichadee, S., & Pattanapichet, F. (2018). Enhancement of performance and motivation through the application of digital games in an English language class. *Teaching English with Technology, 18*(1), 77-92.

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological review, 92*(4), 548.

Wichadee, S., & Pattanapichet, F. (2018). Enhancement of performance and motivation through the application of digital games in an English language class. *Teaching English with Technology, 18*(1), 77-92.

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary educational psychology, 25*(1), 68-81.

Williams, M., & Burden, R. (1997). *Psychology for language teachers.* Cambridge: Cambridge University Press.

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary educational psychology, 25*(1), 82-91.

Appendix A: English language learning motivation survey (English version)

English Motivation Survey (before the experiment)

No. _____ Gender ___Male/Female__ Date_____
1 = very untrue; 2 = mostly untrue; 3 = somewhat untrue;
4 = somewhat true; 5 = mostly true; 6 = very true.

Please check the number that best fits the statement.

		1	**2**	**3**	**4**	**5**	**6**
1	I am interested in English.						
2	My English is good.						
3	I would still take English courses even if they were not required by the university.						
4	I will continue learning English even after I have a full-time job.						
5	I think English is important.						
6	I think English is useful.						
7	English is easy to learn.						
8	I study English with all my effort.						
9	I think my English skill is improving.						
10	I believe I can learn English well.						
11	I will continue learning English in the future.						

Appendix A_J: English language learning motivation survey (Japanese version)

English Motivation Survey (before the experiment)

名前 _____ **男性/女性 日付**_____

1=非常にそう思う 2= そう思う 3=ややそう思う
4=あまりそう思わない 5=そう思わない 6= まったくそう思わない

以下の 1〜11 の意見に対し、最もあてはまる番号に○印をつけてください

		1 非常にそう思う	**2** そう思う	**3** ややそう思う	**4** あまりそう思わない	**5** そう思わない	**6** まったくそう思わない
1	私は英語に興味がある						
2	私は英語ができる						
3	大学の必修科目でなくても、英語のクラスを受講する						
4	就職したあとも、英語の勉強を続ける						
5	英語は重要だ						
6	英語は便利だ						
7	英語を学ぶのは簡単だ						
8	英語の勉強は一生懸命やる						
9	自分の英語力は上がっている						
10	英語を上手に学ぶことができる自信がある						
11	将来も英語を学び続ける						

Appendix B: Infographics Attitude Survey (English version)

Infographics Attitude Survey (after the experiment but before the test)

No. _____ Gender ___Male/Female__ Date_____

1 = very untrue; 2 = mostly untrue; 3 = somewhat untrue;
4 = somewhat true; 5 = mostly true; 6 = very true.

Please check the number that best fits the statement.

		1	**2**	**3**	**4**	**5**	**6**
1	I am interested in Infographics.						
2	I think Infographics are useful for my English learning.						
3	Using Infographics help me to learn English faster.						
4	Using Infographics help me to learn English more easily.						
5	Using Infographics help me to learn English more effectively.						
6	Using Infographics improves my understanding of English grammar.						
7	I like to use Infographics in language learning.						
8	I enjoy my English class more when Infographics are used.						
9	I find Infographics easy to use.						
10	I find Infographics easy to understand.						
11	I want my English teacher to continue using Infographics in English teaching.						
12	I would like to use Infographics for English learning in the future.						

13. If the teacher will continue providing infographics for your future English grammar learning, would you like to sign up for them?

___ Yes
___ No

Appendix B_J: Infographics Attitude Survey (Japanese version)

名前 _____ 男性/女性 日付_____

1=非常にそう思う 2= そう思う 3=ややそう思う
4=あまりそう思わない 5=そう思わない 6= まったくそう思わない

以下の 1〜11 の意見に対し、最もあてはまる番号に○印をつけてください

		1 非常にそう思う	**2 そう思う**	**3 ややそう思う**	**4 あまりそう思わない**	**5 そう思わない**	**6 まったくそう思わない**
1	私はインフォグラフィックに関心がある						
2	インフォグラフィックは自分が英語を学ぶのに便利だ						
3	インフォグラフィックを使うと、より早く英語を学べる						
4	インフォグラフィックを使うと、より簡単に英語を学べる						
5	インフォグラフィックを使うと、より効果的に英語を学べる						
6	インフォグラフィックを使うと、英語の文法がより理解できる						
7	言語の学習で、インフォグラフィックを使うのは好ましい						
8	インフォグラフィックを使った方が授業が楽しい						
9	インフォグラフィックは使いやすい						
10	インフォグラフィックは理解しやすい						
11	英語の先生に授業でインフォグラフィックを続けて使ってほしい						
12	これからも英語の学習に、インフォグラフィックを使いたい						

13 今後、英文法の授業で、インフォグラフィックを使う授業があれば履修しますか？
___ はい ___ いいえ