

Using Self-generated Drawings to Facilitate Reading Comprehension in an Undergraduate EFL Class¹

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Abstract

This study sought to explore the power of self-generated drawing to improve reading comprehension of English language learners in a university setting. Fourteen undergraduate students, divided into control and experimental groups, read a chapter from a graded reader. The experimental group was instructed to construct self-generated drawings as they read to help them with comprehension while the control group only read. The students in both groups were given a pretest to determine their familiarity with the story, a posttest to measure reading comprehension, and were asked to write a short summary of the story to determine their reading comprehension. To learn about future use of the strategy, the students in both groups were asked to complete a self-perception survey. The study revealed mixed results: while the learners that drew while reading showed better reading comprehension when writing a summary, when assessed on a reading comprehension test, those who only read did slightly better. These results cannot be compared to studies involving language learners because of the absence of such studies, but experiments carried out in other disciplines with content area learners showed that learners benefit from drawing as they study. The use of self-generated drawings to support reading comprehension or other aspects of language learning shows promise at the theoretical and practical level. Considering the results reported in this study, more research needs to be done to show the benefits of self-generated drawings for English language learners.

Resumen

Este estudio buscó explorar el poder usar dibujos para mejorar la comprensión lectora de estudiantes del idioma inglés en un entorno universitario. Catorce estudiantes universitarios divididos en grupos control y experimento leyeron un capítulo de un libro graduado por niveles de inglés. El grupo experimental recibió instrucciones de construir dibujos mientras leían para ayudarlos con la comprensión, mientras que el grupo de control solo leía. A los alumnos de ambos grupos se les administró una prueba previa para determinar su familiaridad con la historia leída, una prueba posterior para medir la comprensión lectora y, además, se les pidió que escribieran un breve resumen de la historia para determinar si los alumnos habían aumentado su capacidad de comprensión lectora. Para conocer el uso futuro de la estrategia, se pidió a los alumnos de ambos grupos que completaran una encuesta de autopercepción. El estudio reveló resultados mixtos: mientras que los estudiantes que dibujaron mientras leían mostraron una mejor comprensión de lectura al escribir un resumen, cuando se les evaluó en una prueba de comprensión de lectura, los que solo leyeron lo hicieron un poco mejor. Estos resultados no se pueden comparar con estudios que involucran a estudiantes de idiomas debido a la ausencia de estos, pero los experimentos realizados en áreas STEM con estudiantes de áreas de contenido mostraron que los estudiantes se benefician cuando dibujan mientras estudian. El uso de dibujos para acompañar la comprensión lectora u otros aspectos del aprendizaje de idiomas se muestra prometedor a nivel teórico y práctico; sin embargo, a la luz de estos resultados, está claro que es necesario realizar más investigaciones.

Introduction

Opportunities to read in or listen to English or any other foreign language authentically outside the language classroom are virtually non-existent in mostly monolingual countries. Exposure to the target language is necessary to attain an adequate level of proficiency (Krashen, 1981). One way of getting exposure to a language typically occurs by reading. Teachers of English as a foreign language (EFL) are aware of that and recognize that their students need to get involved in reading and comprehension activities. Learners greatly benefit from the fruits of reading as it provides the learner with high frequency vocabulary and allows them to use the grammar in context (Nation, 2009). To help learners with reading comprehension, various text-only strategies have been suggested (re-reading, skimming, scanning, reading out loud) as well as strategies that involve pictorial representation (drawing, imagination). This second group of strategies, self-generated drawing, has been used by students of STEM disciplines to improve their understanding of concepts that are

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drawable such as organs of animals, components of mechanical devices, and parts of plants. (Fiorella & Kuhlmann, 2020; Meade et al., 2018; Van Meter, 2001; Van Meter et al., 2006). STEM students learn about complex concepts that have visible concrete applications, so having them draw the concept has been found beneficial (Meade et al., 2018). Self-generated drawings are learners' constructions of events and concepts as they read to aid comprehension of the text (Van Meter, 2001). In the English language class, practitioners have explored the concept of self-generated drawing theoretically as having potential to improve reading comprehension (Anim, 2012), but empirical studies are necessary to determine the practical implications and impact of self-generated drawings in the language class to aid reading comprehension.

This study sought to explore the power of self-generated drawings to help university English language learners with their reading comprehension during the COVID-19 pandemic. Having students combine reading with self-generated drawings is a further step that might help EFL learners with reading comprehension and overall language proficiency. The use of self-generated drawing is in its infancy as a resource for learning languages, and therefore more research needs to be done. It is noteworthy to mention that carrying out this experiment using remote instruction presented several challenges from slow internet connections to very few students zooming in; from students with a lot of distress to professors having to coordinate teaching while taking care of their own children at home.

Literature Review

Reading is a key learning activity for students in general and for language learners (Day, 2015; Elley & Mangubhai, 1983; Krashen, 1981). However, it is pivotal that the texts are graded at an appropriate reading level. According to Nation (2013), extensive reading provides foreign language learners with valuable exposure to language input at an appropriate level of difficulty. Nation points out here the importance of considering a learner's level when using reading in the classroom. Learners of countries where there are very few opportunities to use English benefit greatly from programs that include reading in their curriculum (Nation, 2009).

Meaningful comprehension is the goal of reading. Reading involves being capable of deciphering the written text to understand a series of messages. On this, Graesser (2007) said that "shallow readers believe they have adequately comprehended text if they can recognize the content words and can understand most of the sentences. However, deep comprehension requires inferences, linking ideas coherently, scrutinizing the validity of claims with a critical stance, and sometimes understanding the motives of authors." (p. 4). When students decode letter by letter, they use more cognitive power than when word recognition is done automatically. Letter by letter recognition also interferes when meaning making of messages in the texts (Woolley, 2010).

As the goal of reading comprehension is understanding the text, it is necessary to teach reading comprehension strategically (Graesser, 2007). Strategic readers are those learners that engage in any cognitive or behavioral activity to improve any aspect of comprehension. The two categories of cognitive activity are text-focused and model-focused (Fiorella & Zhang, 2018). Text-focused activities include predicting what is going to happen in the story based on the title, formulating questions, scanning the text for important details, skimming the text for the main idea, etc. Model-focused activities include imagining, adding pictures to the text, or even constructing drawings that seek to form a mental representation of what the students are learning or the story they are reading.

Dual code and generative learning theories

Two theories support model-focused activities: Dual Code Theory (Paivio, 1971) and Generative Learning Theory (Wittrock, 1974). According to Dual Code Theory, learning is richer when information is encoded in two ways rather than in one. When people learn using their eyes and their ears, their brain imprints ideas into the memory. Paivio's argument is that encoding new information using two sensory channels produces a deeper impression and more lasting memory of the content being studied. Using self-generated drawings is, in Paivio's words, a form of dual-code representation since including both verbal and visual mental imagery techniques promotes inferential linking, deeper engagement, and interest in reading. When contextual information is incorporated in a text, this benefits comprehension because the reader has an extra aid in representing the text in their head (Woolley, 2010). Using images or translating the text into drawings when studying helps regions of the brain connected with visual memory. Drawing has proven to be more effective than other traditional reading comprehension techniques (Meade et al., 2018).

Fiorella and Mayer (2015) said that the generative learning approach suggests that as students learn new information, they process it and make connections with existing knowledge already stored in their long-term

memory. Such processes include summarizing, mapping, imagining, self-testing, self-explaining, teaching, enacting, and drawing. Engaging in these active mental processes causes the existing knowledge to be transformed into new knowledge. Van Meter et al.'s (2006) theory of drawing construction supports comprehension by fostering the cognitive processes of selecting, organizing, and integrating as learners translate a text into a drawing.

Drawing and reading comprehension connection

Self-generated drawing has been useful to aid reading comprehension. Sadoski and Paivio (2001) on this regard said that "the mental imagery that we experience while reading, either spontaneously or induced by instruction, has powerful effects on comprehension" (p. 164). The potential comes from the visuals created by the reader in their attempt to make meaningful sense of what they read, making it a personal experience.

According to Tereda (2019), combining drawing with reading can enhance students' memory by requiring them to examine concepts from multiple perspectives. Better organization of ideas as the result of self-generated drawing may improve reading comprehension, which in turn could produce better comprehension. As the students draw, they engage in selecting the ideas from the text, organizing them in mental models and creating connections between their prior knowledge and the new learning. When children combine text and images to improve their reading comprehension, this combination has a positive effect in activating their prior knowledge (Wooley).

Self-generated drawing as a meaningful activity can be seen as a product and a process through which learners communicate what is relevant for them, such as their thoughts, emotions, and feelings (Anim, 2012). Fiorella and Zhang (2018) claimed that it was a strategy where learners create representative illustrations to achieve a learning goal. For example, when reading a passage, learners can read and draw with precise instructions to learn something, such as concepts from science texts (e.g., birds, body organs, plants) (Fiorella & Kuhlmann, 2020; Fiorella & Mayer, 2015; Van Meter, 2001).

The learning benefits of using self-generated drawings could be extended to learners of other fields, such as foreign languages. One example comes from the Office of Bilingual Education (2005), which identified the advantages of including art within the context of the lives of English language learners (ELLs) to enable them to express their ideas visually. They indicated that by using self-generated drawing teachers can:

- build on prior knowledge.
- scaffold instruction.
- create a bridge between written and spoken language.
- make learning relevant and meaningful.
- help students develop self-esteem.
- foster creativity.
- develop an appreciation of the past.
- highlight similarities and differences.
- foster higher order thinking skills.
- promote high levels of analysis, reasoning, and questioning.
- support creative thinking.
- model problem solving.
- emphasize interpreting and communication of ideas.
- enhance students' ways of observing, responding to, and representing the world. (p. 3)

Of the benefits expressed on this list, special attention is given to prior knowledge, enjoyment and multiple intelligences, and their connection to constructing self-generated drawings.

Altun & Iraq (2015) suggested that by constructing drawings, the students could demonstrate how they felt, therefore conveying relevant information about themselves. The teachers could use this information to establish connections with the students and get to know them better at a personal level, finding opportunities to craft lessons that consider those personal details. They also said that when English language readers drew, they selected elements and organized them to construct a mental model that combined what the students already knew to the new ideas, creating new understanding and knowledge, as previously indicated by Woolley (2010).

Self-generated drawing has been associated with enjoyment (Anim, 2012; Office of Bilingual Education, 2005). Woolley (2010) argued that using visual imagery, including self-generated drawing as part of his

teaching practices, helped to create a space to ask questions, and to incorporate other kinds of engaging activities where the learners could make connections. Altun and Iraq (2015) concluded that self-generated drawing gives teachers the opportunity to make teaching vocabulary a more vivid activity, exploiting the power of visualization to aid students to encode, process, and recall new vocabulary. When drawing is used in the classroom to help EFL learners encode, process and recall language, they do so by coloring, sharing, and talking about what they created, mostly connecting it with their own lives (Office of Bilingual Education, 2005). From anecdotal observation and interviews with various pre-service and in-service EFL teachers who used self-generated drawing, the teachers commented that they enjoyed listening to the connections that students made when they explained a drawing in relation to their own life. The teachers enjoy looking at the creative power their learners expressed in the drawings (M. Andrade, personal communication, November 23, 2019). When constructing drawings, the English language learners increase the chance for teacher-student and student to student interaction, which adds opportunity for interaction and for language development (Doughty & Long, 2003).

Constructing drawings taps into Gardner's (2011) theory of multiple intelligences. He identified eight types of intelligence. Two of these were directly connected with self-generated drawing: visual spatial and kinesthetic. According to Gardner, visual-spatial intelligence is thinking in a three-dimensional way just as pilots, architects and artists do. The second type of intelligence is kinesthetic (Campbell et al., 2004), which involves touching or manipulating things in order to learn. It is also associated with moving as part of learning.

In connection with these two types of theory of multiple intelligences, Meade et al. (2018) observed that learning with images helps to develop regions of the brain connected with visual memory. Learners who use self-generated drawings benefit from this type of intelligence as it allows them to interact in three ways. First, learners interact with the content being studied because they see the written text; second, they imagine it in their heads to activate prior knowledge; and third, they create a tracing memory as they represent the imagination on paper. Meade found in her experiment that this complex three-input process was better than just transcribing a passage. Most importantly, she discovered that transferring and recalling were as beneficial as paraphrasing a text, which provided an alternative for students that found paraphrasing difficult.

Conditions for benefiting from drawing while reading

Learners of English are at different levels of proficiency, so an important question to ask when using drawings is whether the students are at a proficiency level that guarantees understanding of a passage. The students need to have a minimum overall proficiency in English to take full advantage of learning from reading (Lems et al., 2010). The text that the students read must be graded at an English level the learners can understand. Imagining and drawing require knowing the vocabulary in the story and deciphering the grammatical structures in the sentences.

Another important consideration is whether the text allows for imagination. Fiorella and Khulmann (2020) advised taking advantage of passages that were very descriptive because they offered great space for drawing. The selected story needs to be full of graphic references, so that mental visualization is not an obstacle. For this reason, the teacher should carefully select chapters or sections within the chapters to make drawing easy. By selecting a chapter, the students can understand as they focus, within their drawing skill possibilities, on representing the main ideas in the stories.

Self-generated drawings as a teaching strategy have been amply researched as part of initiatives that sought to improve text understanding, memory retention, and knowledge transfer in science classes like math, botany, biology, where expository texts are used, and descriptions refer to a single specific concept, mostly concrete and di(visible) (Fiorella & Zhang, 2018; Paquette et al., 2007; Van Meter et al., 2006; Wammes et al., 2016). Most studies have involved learning from academic texts, and included measures of meaningful learning outcomes (e.g., recall, comprehension, and transfer).

Rooney (2020) conducted an undergraduate research project in which third-grade students were given the opportunity to read without drawing the first time. The students read and drew during the second reading and were tested to assess their reading comprehension. The results showed that the students were more accurate in their responses when they read and drew, but even more importantly, they improved their scores on depth of response. Another pair of researchers, Altun and Iraq (2015) studied the advantages of using self-generated drawing for understanding and memorizing vocabulary. They concluded that drawing gave a great advantage to learning new vocabulary of concrete concepts. Self-generated drawings as a teaching strategy have been predominantly approached as a theoretically good idea in language

teaching/learning (Wammes et al., 2016). Rigorous experiments need to be conducted to test the effects of self-generated drawings using narrative texts (e.g., graded literature readers) on the reading comprehension of English or other languages. This research attempts to bridge this gap and add to the discussion in this under researched area.

Research Questions

Aware of the potential that self-generated drawings represent for helping EFL learners advance their reading comprehension skills, this study was designed to explore whether drawings could help students develop their reading comprehension while they read a graded classic literature as part of their English language class. The research questions were as follows:

RQ 1. Do participants who use self-generated drawing as a reading comprehension strategy perform better on a reading comprehension test than participants who do not draw as they read?

RQ 2. Do participants who use self-generated drawing as a reading comprehension strategy produce better summaries than participants who do not draw as they read?

RQ 3. How do students perceive self-generated drawing as a reading comprehension strategy?

Method

The experiment was carried out by three faculty members from three different universities located on the coastal region of Ecuador. To avoid confusion, the term *experimenters(s)* will be used to refer to the faculty member who conducted the experiment, and the term *faculty member* will be used to refer to the students' instructor who gave the directions and coordinated actions with the experimenters. In this section the undergraduate students will be referred to as *participants*.

Participants' characteristics

The participants were 21 undergraduates (eleven females and ten males) in the sixth semester of the English teacher education program at a public university on the coast of Ecuador. The students were 20 to 32 years old ($M = 23.68$, $SE = 1.05$). The participants were from cities and towns of the central coast of Ecuador. They were randomly split into two different groups of ten and eleven, and completed the experiment in three phases.

The participants' English proficiency was tested using a free internet-based standardized test called EF SET (English First, 2022). This test was designed to assess students' reading and listening comprehension. The students ranked in the lower A2 level ($M = 37.06$, $SE = 2.519$), according to the Common European Framework of Reference (CEFR) (Council of Europe, 2009). Their level of proficiency at this level allowed them to deal with simple, straightforward information and to express with some difficulty in familiar contexts (Table 1). While the EF SET aims to provide a reliable measure of English skills, it is important to note that free online tests may not always achieve the same level of validity and reliability as standardized tests administered in a controlled environment.

Participants' consent

First, the researchers completed and submitted an Institutional Review Board (IRB) form to the ethics committee. Permission by the ethics committee to go ahead with the experiment was granted three weeks after submission of IRB which included a consent form and a debriefing of the experiment text.

Prior to the start of this experiment, the students attending the selected class were informed about the research, the details of the experiment, the duration, and a general description of the types of activities they would be doing. They were informed that the experiment would last approximately two hours, adhering to similar studies such as Van Meter et al. (2006). The students' participation in the experiment was optional.

CEFR English Level	I Can Do Statements
A1	I can understand familiar names, words, and simple phrases on notices, posters etc.
A2	I can find specific information in simple everyday material (timetable, menu, etc.). I can understand short simple personal letters.
B1	I can understand texts about areas of everyday and job-related language. I can understand private letters about experiences, dreams, and hopes.

Table 1: Description of English levels

Design

We conducted a two-group experimental design, with random assignment of participants who were assigned to control and experimental groups by asking the participants to count off. The distribution of the participants to the two groups was relatively even. Drawing condition and non-drawing condition groups were formed. In the experimental group, participants read chapter one of the graded book *The Newspaper Boy* retold by Escott (2005), and constructed drawings before, during and after reading the chapter. Participants in the non-experimental group read only the assigned pages and were instructed on typical reading comprehension strategies such as re-reading, skimming, and taking notes. Both groups received six comprehension questions after completing the reading.

Materials

To carry out this experiment, the researchers used a story from a graded reader and pieces of blank pages where the participants drew the scenes and elements of the story that would help them in the comprehension of the stories read.

Graded reader

The story selected was *The Newspaper Boy*, a graded novel published by Macmillan Heinemann (Escott, 2005). The participants read the first chapter called *Thieves in the Shop*. The book was graded at a beginner level equivalent to CEFR A2 and was 336 words in length.

Pages and materials for drawing

The participants in the experimental group used three blank A4 sheets of paper, one for before reading, one for during reading, and one for after reading. They also were asked to have a #2 pencil and color pencils, an eraser, and a pencil sharpener. Participants in the non-experimental group used one blank A4 sheet of paper to take notes as they read the assigned chapter.

Instruments

In order to answer the research questions, the researchers used four instruments: a prior knowledge questionnaire, a post-reading comprehension test, a written summary rubric and a self-perception survey.

Prior knowledge questionnaire

This instrument was designed to help to determine the level of familiarity the participants had with the story. (Appendix 1). It consisted of several titles of graded readers which the participants had to mark as read or not read. This simple questionnaire sought to prevent any advantage given to participants when completing the reading comprehension exercises or constructing the summary of the passage.

Posttest-multiple choice comprehension questions

The multiple-choice test contained items that had four choices (Appendix 2). Each question had one correct and three distractor choices; correct choices were text explicit. An example of a question from this text is: *Why did Toby enter the shop?* The multiple-choice options for this question were in order: *because he wanted to rob the shop, because he wanted to deliver the newspaper, because he wanted to buy candy, because something was unusual*; the correct answer was *because something was unusual*. This test was given using the platform Quizizz (<https://quizizz.com>). Students had 20 seconds to read and answer each question.

Written summary

After the participants in both conditions had completed reading, they were asked to write a comprehension summary of the story. The summary needed to be between 40 and 60 words in length. To assess the quality of the summary, a 12-point rubric designed by the researchers was used (Appendix 3). The rubric was composed of four categories: purpose and form, organization, style, and mechanics and spelling.

Self-perception survey

The last assignment asked the participants to complete a self-perception survey to explore the participants' future use of self-generated drawings as a reading comprehension strategy. The survey used a Likert scale format with the options I strongly agree, I agree, Neutral, I disagree, and I strongly disagree. The three questions asked were (1) *I usually like to draw to learn English*, (2) *I think that drawing helps me to learn English* and (3) *From now on, I will create drawing to learn English*.

Procedures

The researchers provided instructions for learners to complete the questionnaire, the reading comprehension test, the written summary and the self-perception survey, described in the previous sections. Next, the reader can view the specific directions that the participants were given.

Determining familiarity with story

Before the experiment was conducted, the faculty member gave the students a questionnaire with four titles that the participants had to mark as "read" or "not read". The four titles were *The Newspaper Boy*, *Allissa*, *The Adventures of Tom Sawyer* and *Sara Says No*.

Introduction to the experiment

This experiment was conducted during the COVID-19 Pandemic, and teaching was done remotely via Zoom. The faculty member started the session by introducing the experiment, explaining that a team of experimenters was investigating reading comprehension. It was clarified that participation was voluntary. The class was then turned over to the experimenters. The experimenters explained that the study would compare two methods of reading in which students would read the first chapter of a novel. They went on to say the study would reveal which method was more effective. The experimenters told the two groups that they would go to separate breakout rooms on Zoom to read the chapter called *Thieves in the Shop*, about which they would answer four comprehension questions and write a 40-to-60-word summary of it, followed by a self-perception survey they needed to complete.

After the instructions were given, the participants were randomly assigned to the experimental group and the control group. One experimenter went with each group to conduct the study in the breakout rooms. To ensure reliability, each experimenter used the same script to give instructions. They told the students in each group that the purpose of the experiment was to help them comprehend a text in English better. They said the participants needed to concentrate and do their best to comprehend the text. The participants in both groups were reminded that each would receive three links in the chat box to complete the assignments of the experiment: A link to a PDF document; a link to a comprehension test on Quizizz where students would answer the four comprehension questions; and a third link to word-processing software that would let them write the comprehension summary. The software did not assist with grammar or punctuation. Finally, a link to a Google form was shared for them to complete the self-perception survey.

Directions given to participants

The participants were given directions from the researchers to conduct the tasks in a uniform way. These directions are shared below verbatim for researchers interested in replicating this study.

Drawing

The experimenter gave the following instruction to the participants in the experimental group:

You are going to read Chapter 1 of the novel Newspaper Boy. To help you understand the story, you are going to draw at three phases of the story: before you read, while you read, and after you read. Your first drawing will be based on the title of the chapter. As you read you can adjust your original drawing; once you have finished the reading, you have a last opportunity to finish any details you want to add to your drawings. The drawings you will construct do not have to be beautiful, as they will only help you with comprehension. You will draw on the three blank sheets of paper, and use a #2 pencil, a pencil sharpener, an eraser, and color pencils if you wish. After you have completed the reading and drawing, you are going to summarize the chapter in between 40 and 60 words. You have up to 30 minutes to read the story and draw, and up to 15 minutes to compose your summary. Once you have completed these two parts, you will return to the main room and wait there with the faculty member until everybody has returned to the main room. When everybody from the two groups is back in the main room, you will take a four-question multiple choice comprehension test using Quizizz.

Non-Drawing

The participants in the non-experimental group were given the following directions:

You are going to read Chapter 1 of the novel Newspaper Boy. To help you understand the story, you are going to formulate questions based on the title, take notes, re-read if you don't understand, read out loud, etc. After you have completed the reading, you are going to summarize the chapter in 40 to 60 words. You have up to 30 minutes to read the story and draw, and up to 15 minutes to compose your summary. Once you have completed these two parts, you will return to the main room and wait there with the faculty member until everybody has returned. When everybody from the two groups is back in the main room, you will take a four-question multiple choice comprehension test using Quizizz.

Results

This section contains the results of data obtained from three instruments: (1) a reading comprehension multiple choice posttest, (2) a writing comprehension summary, and (3) a self-perception survey. These instruments were utilized to provide answers to the research questions.

Questionnaire to determine familiarity with text

One important aspect of this study was to make sure that the participants were not familiar with the plot of the story they were going to read. The participants were asked to answer *yes* or *no* to the question, *Which of the books listed below have you read, or watched, or listened to?* This question was asked during class using the *Zoom poll* feature (Zoom Support, 2022) a day before the experiment took place, as part of a regular English learning activity. Table 2 shows the results.

Title in English	Title in Spanish	Have you read the book?	
		Yes	No
The Newspaper Boy	El Repartidor de Periódicos	0	21
Allissa	Allissa	4	17
The Adventures of Tom Sawyer	Las Aventuras de Tom Sawyer	15	6
Sara Says No	Sara Dice No	12	9

Table 2: Summary of the books read by participants

Flowchart of subjects

We had a high attrition level because of COVID-19 and the quality of the internet. We started with 21 participants and analyzed data from 14 students. In Figure 1 we present the flow of our sample.

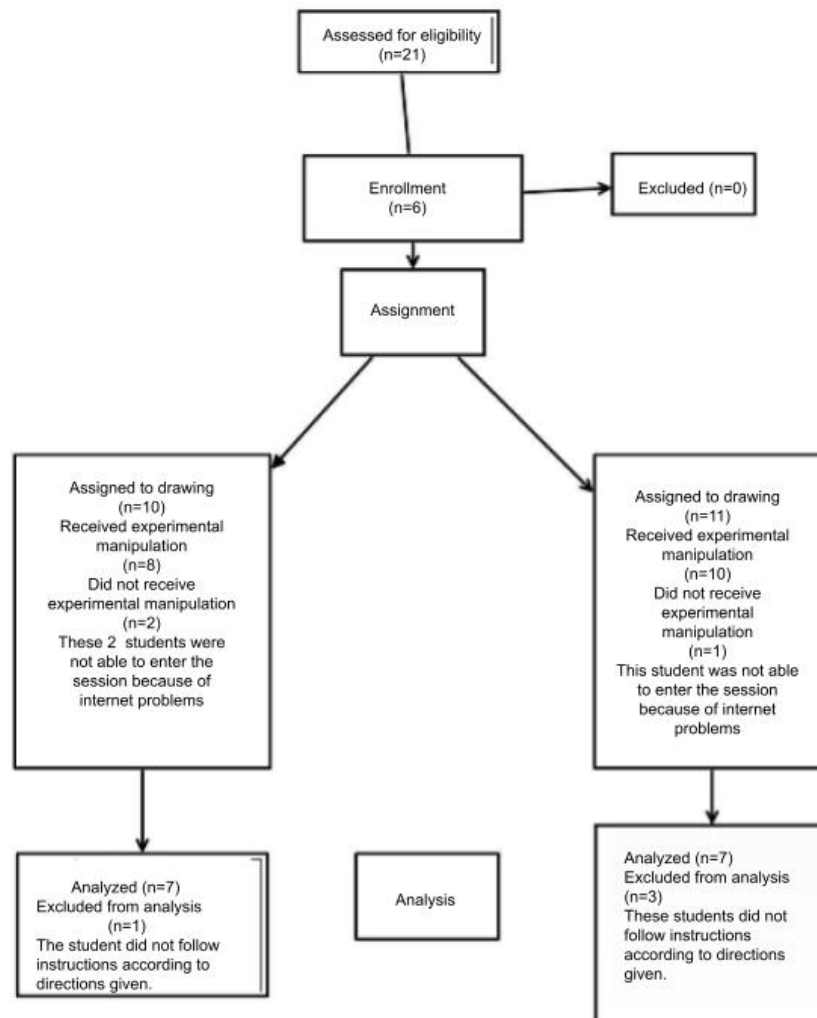


Figure 1: Flowchart of the Subjects

Did the participants in the experimental group perform better using self-generated drawings?

We gave the participants an online reading comprehension test using the app Quizizz. The participants in the non-experimental group obtained better scores than the participants in the experimental group by 0.42 points (see Table 3).

Did the participants in the experimental group perform better when producing a written summary of story?

To answer the question whether the participants in the experimental group performed better (or worse) as they read the story, both groups were given the opportunity to summarize the chapter they read. The participants in the experimental group obtained a score that was 0.92 points above the score obtained by the non-experimental group.

Measure	Experimental Group		Control		Difference in scores
	M	SD	M	SD	M
Multiple Choice Comprehension Test	2.29	1.70	2.71	1.25	-0.42
Written Summary	6.32	3.77	5.40	2.93	0.92

Table 3: Comparison of performance on multiple choice comprehension test and written summary

How did the participants feel about using self-generated drawings as a reading comprehension strategy?

The third research question inquired into the participants' perceptions about drawing for learning English. To this purpose a self-perception survey was administered to the students in the experimental group. This instrument presented three statements (See Table 4). As for the first question, 57.13% (the sum of "strongly disagree" and "disagree") of the participants in the experimental group indicated they did not usually like to draw. When the participants in the experimental group were asked their perception about learning English using drawings, 42.85% (the sum of "strongly agree" and "agree") answered affirmatively. The last question asked about the students' perceptions of using self-generated drawings in the future as a routine learning strategy. Only 28.57% of the respondents would use it in the future.

Statement	Experimental group				
	Strongly disagree	Disagree	Neither	Agree	Strongly agree
I usually like to draw	14.28%	42.85%	14.28%	28.57%	0
I think that drawing help me to learn English	0	14.28%	42.85%	28.57%	14.28%
From now on, I will make drawings to learn English	0	14.28%	57.14%	28.57%	0

Table 4: Self-perception survey to determine future use of the drawing to learn English

In the next section, these results are discussed in line with the existing literature and with emphasis on the context in which they occurred.

Discussion

The analysis revealed (1) that the participants in the experimental group scored lower than those in the non-experimental group on the comprehension test; (2) that the participants in the experimental group created written summaries that yielded a higher score than those in the non-experimental group; (3) that the participants had not studied English constructing self-generated drawings; (4) that after the study, the participants perceived that self-generated drawings would help them with their study of English; and (5) that the participants were mostly indifferent about using self-generated drawings to learn English in the future.

It was argued that participants in the drawing group would perform better on a multiple-choice reading comprehension test than those in the reading-only group, because the participants would benefit from processing the information using two ways of encoding (Paivio, 1971; Sadoski & Paivio, 2001). While recalling information from fictional stories may not require drawing, the multiple choice format of the reading comprehension test, with its four pre-set answer choices, might have limited the potential benefits of dual coding.

It was also supposed that the participants would create better summaries of the stories compared to those in the read-only group. This was confirmed. It is apparent here that the participants, during this part of the experiment, were able to take full advantage of the combined effect of processing textual information and visual information.

The first question of the self-perception survey revealed that the participants had not used drawings previously to learn English. It appears that using self-generated drawings was not part of the repertoire of learning strategies that this group of students would use when studying English. However, as revealed by the second question of our survey, the participants perceived that drawing would help them to learn English better. After the experiment, it seems that the participants perceived using drawings as an extra layer of coding information as potentially beneficial for their language proficiency. This is supported by Altun and Iraq (2015) who found multiple benefits in drawing as it "helps students cultivate their capacities to imagine and visualize in their minds, allowing for quicker learning" (p. 92).

Despite expressing that drawing would help them learn English better, the participants in the last question of the survey revealed indifference as to whether they would use drawings to learn English in the future. This result coincided with Cheng and Beal's (2020) study in which three groups of learners who used drawings for learning perceived the learning strategies to be useful, but had significantly lower attitudes on intended future use. This finding presents an opportunity for research as to why learners cannot foresee themselves making drawings in the future despite their seeing the positive perceived effect of drawing. It is possible that drawings take time and students do not want to add the extra cognitive load that drawing represents.

Limitations

The study originally involved 21 students whose number was reduced to 14 by the time of analysis due to weak internet connections. Also, the fact that this experiment lasted two hours was an added limitation. This, of course, restricts the possibility to make generalizations.

Because of the COVID-19 restrictions imposed in Ecuador (España, 2021), the study was conducted via Zoom. All phases of the experiment used Zoom features such as breakout rooms, and other online resources for participants to carry out the activities. The results of this experiment might have been different if it had taken place in the regular face-to-face classroom.

In addition to the limitations regarding the experimental design, another factor that impacted the study was the participants' ability to draw. The ability to draw or the quality of the drawings created by the participants was not analyzed in this study since participants were not taught how to draw or how to approach drawing. For example, they were not instructed to use different ways of pictorial representation, such as using symbols or arrows, or to incorporate text, such as using labels. It is noteworthy for future research to address each of these issues to further specify the benefits and boundaries of learning by drawing.

Implications

The implications that follow should be taken within the limitations of this experiment, and it is recognized that more studies, both new ones and replications of the present one, should be done to inform better this area of English language learning.

Reading has been identified as a language learning activity that gives learners the advantage to view vocabulary, grammar and pragmatics (August et al., 2016; Cheng & Beal, 2020; Nation, 2009). And using self-generated drawing permits them to capture these aspects in a way unique to each person, making it a personal experience (Paquette et al., 2007; Rooney, 2020). The outcome of this study led us to three implications.

The first implication is that the content needs to be easily imaginable, and as a result, drawable, so learners can benefit from self-generated drawings. In other words, the text needs to be full of descriptions that can trigger visualizations to the minds of the students. Teachers need to be selective and have their students use the strategy sporadically with those parts that best call for their use.

The second implication is that learners need to be able to have a minimum level of proficiency known as linguistics threshold (Lems et al., 2010) to be able to transfer their reading competency from their first language, and therefore understand the story. In other words, the learners need to have a minimum proficiency level in the target language to benefit from reading and be able to participate in reading comprehension activities. Students with a strong A1 English level (Council of Europe, 2019) start collecting the benefits of reading in the target language proficiency given that the book is graded at that level or

below. Students placed at Pre-A1 or below simply did not have enough knowledge of grammatical structures or the necessary vocabulary to gain understanding from the stories regardless of their reading proficiency in their first language.

The third implication is that English language teachers are constantly looking for ways to improve their students' language skills in the target language. Using drawings as a teaching strategy can be used with other aspects of the language such as vocabulary. Teachers willing to go the extra mile can have learners use drawings as a precursor to writing activities, grammar activities and others to advance their English learning. Some of the activities include open-ended questions to get students to pay attention to self-generated drawings. Questions that can be used in this regard are "What do we see here?" and "What do we see at the top of the drawing?" Teachers can also have students make personal connections to the drawings. For example, a possible question could be "Does the drawing remind you of something in your house?" Additionally, the participants can also create a narrative that relates to the drawing using questions such as, "What is the person in the drawing going to do next?" or "What emotions might the characters be feeling?"

Conclusion

This study investigated the impact of self-generated drawing on reading comprehension among English language learners in a university context. Fourteen undergraduate students were divided into control and experimental groups, with the latter instructed to draw while reading. Both groups completed pre- and post-tests, wrote summaries, and filled out self-perception surveys. The results were mixed. While the drawing group demonstrated better comprehension in their summaries, the control group performed slightly better on the reading comprehension test. The study is limited by the lack of comparable research on language learners, though studies in other fields support the benefits of drawing for content learning. The use of self-generated drawings in language learning shows promise, but further research is needed to specifically examine its effectiveness for English language learners.

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Appendices

Appendix 1

Survey to determine books not read by participants

Please check the books that you have not read.

Title in English	Title in Spanish	Yes	No
The Newspaper Boy	El repartidor de periódicos		
Allissa	Allissa		
The Adventures of Tom Sawyer	Las Aventuras de Tom Sawyer		
Sara Says No!	Sara Dice No		

Appendix 2

Multiple Choice Comprehension Post-test

QUIZZZ Hojas de trabajo

Quiz Thieves in the Shop

Total de preguntas: 4

Tiempo de la hoja de trabajo:

Nombre del instructor:

Nombre

Clase

Fecha

-
- What kind of job does Toby do?
 - He delivers newspapers
 - He doesn't work
 - He sells bottled milk
 - What were the men buying in the shop?
 - Milk
 - Sweet and Candy
 - Newspapers
 - None of the options
 - Why did Toby enter the shop?
 - Because he wanted to deliver the newspaper.
 - Because he wanted to buy candy.
 - Because he wanted to rob the shop.
 - Because something was unusual.
 - What answer makes the most sense about the story
 - Mr. Spry was angry because Toby entered the shop without his permission.
 - Mr. Spry was shocked to see the men in the shop.
 - Mr. Spry was indifferent to what he saw in the shop.
 - Mr. Spry was surprised to see Toby and his friends in the shop.

Appendix 3

Paragraph Summary Rubric

	Distinguished	Skilled	Limited	Unsatisfactory
Purpose & Form	Summary demonstrates a strong focus and concisely catches the main points of the original article. The main idea is clear, sustained and supporting details presented in the same order as original. Length of summary is appropriate. (5 points)	Clear main idea and sufficient and relevant supporting details within summary gives reader an adequate understanding of content of original article. Summary is slightly too long or too short. (4.5 points)	Main idea presented in summary is evident but supporting details are only minimally supportive, leaving reader with a vague understanding of the content. Summary is noticeably too long or too short. (4.25 points)	No clear topic sentence to indicate main idea of summary. Supporting details are weak and not clear about what idea they are supporting. Summary is significantly too long or too short. (3 -0 points)
Organization	Organization of summary is logical and coincides with the original. There is a well-linked beginning, middle and end. Excellent use of transitions within summary (4 points)	Overall organization of summary demonstrates a strong beginning, middle and end. Clear use of transitions. (3.5 points)	Recognizable beginning middle and end. Use of transitions is attempted within written summary (3.25 points)	No clear beginning, middle end. No use of transitions within written summary. (3-0 points)
Style	Voice is objective and impartially presents article's point of view.* Vocabulary reflects accurately the degree of complexity of the original article. Sentence structure is varied. (2 points) (*except as explicitly requested by assignment)	Voice is objective and no personal opinion is evident.* Vocabulary is appropriate to the purpose of the writing. Effective use of some sentence variety. (1.5 points) (*except as explicitly requested by assignment)	Writers voice is evident and summary reflects the writer's opinions. Attempts to use vocabulary from within the article. (1.25 points)	No distinguishable voice. Vocabulary is simple but sufficient to convey basic ideas. (1-0 points)
Mechanics and Spelling	Writing is free of all spelling and mechanical errors (1 point)	Writing has been well edited. Occasional spelling and mechanical errors do not distract the reader. (.5 point)	Many errors in spelling and mechanics that distract the reader. (.25 points)	Writing has not been edited and contains many spelling and mechanical errors. (0 points)