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Research article

AI-Generated Images as a Teaching Tool in Foreign Language Acquisition

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Abstract

The objective of the present study is to examine the potential of artificial intelligence (AI) and related technologies in the development of innovative teaching tools for foreign language acquisition. In particular, the possibility of generating images based on textual prompts is regarded as a valuable tool for the creation of textbooks and other teaching materials, as well as for improving the quality and effectiveness of the teaching process. This is due to the fact that visual elements are more easily perceived and understood by learners, which simultaneously increases their motivation. In light of his own experience in developing a new professional English textbook for students majoring in Landscape Architecture, the author presents examples of vocabulary-centered exercises in which AI-generated images were successfully integrated. Furthermore, this paper proposes several methods for integrating AI image generators into foreign language lessons. The findings of the research demonstrate that AI image generators are a time-saving, cost-effective and user-friendly technology that enables the creation of visual teaching tools designed to train specific topics, memorize and review specific vocabulary. It can facilitate the development and reinforcement of communicative and creative skills. Despite the central position of AI-based technologies in our everyday lives and scientific research, the potential of AI-generated images in the educational process, and in foreign language acquisition in particular, is a topic that has yet to be sufficiently explored and warrants further investigation.

Keywords: Artificial intelligence; Visualization; Language pedagogy; Foreign language acquisition; Professional English; Vocabulary building; Landscape architecture

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Научная статья

Сгенерированные с помощью ИИ изображения как средство обучения в преподавании иностранного языка

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Аннотация
Цель настоящего исследования — раскрыть потенциал искусственного интеллекта (ИИ) и связанных с ним технологий в разработке инновационных средств обучения для изучения иностранных языков. В частности, возможность генерирования изображений на основе текстовых запросов рассматривается как ценный инструмент для разработки учебно-методических пособий и материалов, а также для повышения качества и эффективности учебного процесса. Это связано с тем, что визуальные элементы легче воспринимаются и понимаются обучающимися, что одновременно повышает их мотивацию. В статье обоснована важность визуальных элементов и технологий ИИ в образовательном процессе, представлен обзор бесплатных генераторов изображений на основе технологий ИИ, доступных в настоящее время на территории РФ. Описываются интерфейс и характеристика каждого генератора, сравниваются изображения, полученные при вводе одного и того же текстового запроса. Также приводятся примеры возникающих проблем. С учетом собственного опыта разработки нового учебника по профессиональному английскому языку для обучающихся по направлению “Ландшафтная архитектура” приведены примеры лексико-грамматических упражнений, в которые были успешно интегрированы сгенерированные с помощью ИИ изображения. Кроме того, в работе предложено несколько методов интеграции генераторов изображений на основе ИИ в аудиторную работу на занятиях иностранного языка. Результаты исследования показывают, что генераторы изображений на основе ИИ являются времясберегающей, экономически оправданной, простой в освоении и использовании технологией, которая способствует разработке визуальных средств обучения, направленных на практическое применение определенных лексико-грамматических структур, а также может способствовать развитию и укреплению коммуникативных и творческих навыков. Несмотря на ключевую роль технологий на основе ИИ в нашей повседневной жизни и научных исследованиях, потенциал сгенерированных с помощью ИИ изображений в учебном процессе и, в частности, в обучении иностранным языкам является актуальной темой, которая требует дальнейшего исследования.

Ключевые слова: Искусственный интеллект; Визуализация; Лингводидактика; Обучение иностранным языкам; Профессиональный английский язык; Наработка словарного запаса; Ландшафтная архитектура

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INTRODUCTION

The central idea of the present research was initially conceived while confronted with a relatively complex task: the development of a new professionally oriented English language textbook for students majoring in Landscape Architecture. The majority of available textbooks are based on a traditional text-centered approach, with an emphasis on the acquisition of grammatical rules and specialized vocabulary through reading and translation activities. Consequently, these textbooks fail to meet the learners' needs with regard to the development of communicative skills and their preferences in terms of the presentation of the materials. It was evident from the author's teaching experience that the use of images could enhance the memorization of specialized vocabulary among learners, facilitate their comprehension, and motivate them. Furthermore, the incorporation of visual elements would serve as a valuable aid in language practice, both orally and in writing. This assumption can be readily substantiated by a considerable body of research, which over the past few years has highlighted that students – and people in general – are likely to better perceive a visual representation than written words (Syrina, 2016, p. 81).

The narrow specialization of the textbook (English in the field of landscape architecture) also entailed certain challenges in finding images that would adequately reflect the specific vocabulary that students would be expected to learn and utilize. It was determined that the most straightforward solution to this issue was to resort to the latest technological advancements in the field of artificial intelligence (AI) and image generation. The use of AI to generate images for the textbook should afford complete control over the representation of specific content in the images, which is ideal for training targeted vocabulary. In addition, AI can generate images almost instantaneously, reducing the time required for production. However, the relative novelty of such technologies, necessitates preliminary research from both theoretical and practical points of view.

RESEARCH OBJECTIVES

The objective of this research is to elucidate the potential for integrating AI technologies, with a particular focus on AI-generated images, into the foreign language acquisition process. This integration can be achieved not only by generating images for educational materials, such as entire textbooks or thematic worksheets, but also by incorporating such technologies as an integral component of the learning process within the classroom.

To achieve this objective, the following research tasks were identified:

1) substantiating the use of both visual components and AI technologies in the teaching process by studying the corresponding theoretical background;
2) researching and comparing different open-source AI image generators that are available online;
3) identifying common issues in image-generating technologies;

4) elaborating diverse training exercises that can be enhanced through the incorporation of visual elements and generating the corresponding images using the previously analyzed online resources;

5) designing classroom activities that engage students in the image generation process while simultaneously reinforcing their language skills;

6) summarizing the benefits associated with the use of AI-generated images as a teaching tool.

THEORETICAL BACKGROUND

The term 'visualization', derived from the Latin *visualis*, meaning 'attained by sight', can be defined as the representation of a physical phenomenon or process in a format suitable for visual perception (Azimov & Shchukin, 2009, p. 38). From a practical standpoint, the primary forms of visualization are illustrations, digital storytelling, and video content. The advantages of visual elements at the cognitive level have been well documented, beginning with the seminal works of Allan Paivio on dual-coding theory. In this framework, the so-called picture superiority effect — the tendency for images to be remembered more easily than words — was first articulated (Paivio & Csapo, 1973). The advantages of visual elements in education, particularly in the context of language acquisition, have been substantiated by numerous researchers over time. In particular, research has demonstrated that the human brain processes visual elements more rapidly than verbal ones (Levie & Lentz, 1982). As part of the learning process, visual elements facilitate comprehension, enhance memory retention, promote long-term memorization, boost motivation, and enhance information processing efficiency (Aradakhova et al., 2023; Shchipitsina, 2022; Suryanto, 2014). In the context of foreign language teaching, visual elements have been employed primarily as a tool for vocabulary building and reinforcement, as well as for the creation of mind maps, enhancement of visual literacy, and improvement of description skills (Agaltsova & Milyaeva, 2022; Aradakhova et al., 2023; Izotova & Buglaeva, 2015; Markelova, 2021; Vikhrova, 2018;).

Artificial intelligence (AI) is a relatively novel technology that can be defined as a system created by humans that is capable of imitating human intellectual and creative skills, including the ability to obtain and analyze information, plan and improve one's work, learn, and create results of intellectual activity (Shchebelskaya & Mayer, 2023, p. 77). AI technologies are applied in our everyday lives to perform such tasks as machine translation, text-to-speech and speech-to-text conversion, optical character recognition (OCR), and content creation. The release of ChatGPT by the US company OpenAI in 2022 marked a significant milestone in the advancement of AI technologies, particularly in light of the subsequent release of GPT-4 in 2023 (Katz et al., 2024). AI technologies are now becoming an integral part of the digitalization process of education. They have proven themselves to be a useful tool which can make both the teaching and learning processes more efficient (Butorina et al., 2004; Antonova et al., 2018; Amirov & Bilalova, 2020; Korovnikova, 2021). In the context of foreign language acquisition, AI technologies have been successfully employed for the creation of texts, reading comprehension exercises, sentences with specific terms or grammatical structures, as well

as for real-life communication and to receive feedback on written texts and oral presentations (Kondrakhina & Petrova, 2024; Kostyunina, 2022; Lapina, 2023; Shchebelskaya & Mayer, 2023).

A recent paper published by Carissa Wong (2024) in the News Explainer section of *Nature* examines the potential benefits and threats associated with the use of AI-generated images in research papers. Nevertheless, the potential of AI for generating images as a teaching tool remains largely uncharted territory, as evidenced by the comparatively limited number of papers on this subject. Notably, none of these papers delves into the potential of such images in facilitating foreign language acquisition (Aktay, 2022; Pataranutaporn et al., 2021; Reed et al., 2023; Samarina & Boyarinov, 2023; Vartiainen & Tedre, 2023).

MATERIAL AND METHODS

The research project concentrated on seven distinct open-source AI image generators that are currently accessible from the Russian Federation. All the prompts utilized for image generation were developed by the author in accordance with the foreign language syllabus designed for students majoring in Landscape Architecture. The grammatical structures and vocabulary units used in the prompts were selected in compliance with educational guidelines, the curriculum for the bachelor of science in Landscape Architecture, and the Foreign Language program.

The universal methods of analysis, synthesis, and generalization were employed throughout the research process, including during the literature review, when comparing the characteristics and interfaces of the AI image generators under study, and when discussing the results obtained through each of them.

AI IMAGE GENERATOR COMPARISON

At the time of writing, a Google search for ‘AI image generator’ shows almost 2 million results. However, the range of generators to be analyzed in this study was limited for practical reasons to open-source generators currently accessible from the Russian Federation:

1) Craiyon v3, available at https://www.craiyon.com/;
2) Freep!k Pikaso, available at https://www.freepik.com/pikaso/ai-image-generator?oldtti=1&tti=1;
3) Pixlr, available at https://pixlr.com/image-generator/;
4) Deep AI, available at https://deepai.org/machine-learning-model/text2img;
5) Kandinsky 3.0, available at https://www.sberbank.com/promo/kandinsky/;
6) NeiroPlod [*НейроПлод*], available at https://nplod.ru/;
7) Shedevrum, an application downloadable from App Store, Google Play, and AppGallery.

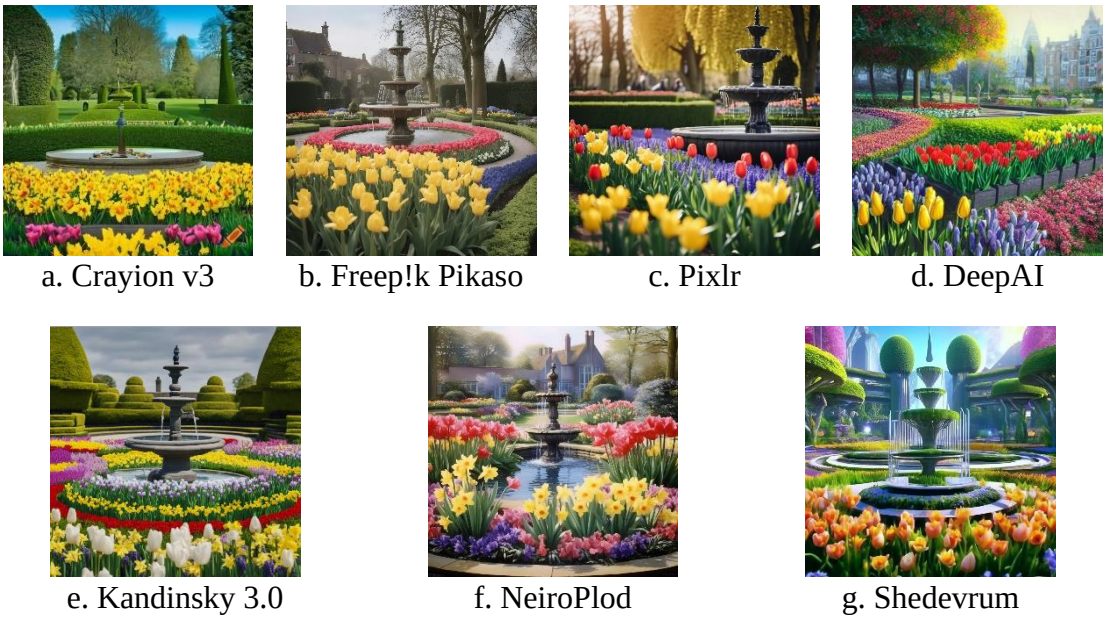
The first step of the comparison focused on the following features: required sign-up procedure, formatting options, number of images generated per prompt, styling options, and additional features. The results of the comparison are shown in Table 1.

Table 1. Comparison of the open-source AI-image generators

AI-image generator	Required sign-up	Formatting options				Pictures per prompt	Styling options	Other controllable parameters
		1:1	16:9	9:16	Others			
Crayion v3	No	✓	—	—	—	9	4 options	negative words, prompt suggestion
Freep!k Pikaso	Yes	✓	✓	✓	2:3 4:5 3:2 5:4	1 – 4	15 free and 8 premium options	coloring, framing, lighting
Pixlr	Yes	✓	✓	✓	—	4	16 options	coloring, lighting, composition, negative words, make private
Deep AI	No	✓	✓	✓	3:2 2:3	1	100+ styles	standard vs. HD vs. genius, 'illusion' effects
Kandinsky 3.0	Yes	✓	✓	✓	3:2 2:3	1	18 options	negative words
NeiroPlod	Yes	✓	✓	✓	1:2 3:1 4:1	6	*manual input*	4 different neural networks
Shedevrum	Yes	✓	—	—	—	2	*manual input*	v. 1.1, v. 1.2, v. 1.3

As the table shows, some features and options are limited to the premium versions. It should be also noted that, while the vast majority of the AI image generators are completely open source, users of Freep!k Pikaso are only allowed to generate 20 images per day for free, and must choose a subscription plan if they want to generate more. Pixlr, on the other hand, has a token-based system for purchasing images; when users first sign up, they are offered 20 free tokens that allow them to generate the same number of images, and then they are asked to purchase more tokens to continue generating. It should also be noted that some AI image generators, namely Craiyon v2, Freep!k Pikaso, and Pixlr, offer a large gallery of user-generated downloadable images on their home pages; NeiroPlod's interface looks like a social media wall that is updated in real time with newly generated images; Shedevrum positions itself as a kind of social media, urging users to share the generated images before granting them permission to download them.

In order to compare the performance of the different platforms under study, they were all given the same prompt: 'A flowerbed with tulips, daffodils, and hyacinths with a fountain in the center and topiary in the background' (underlined words are specialized terms from the field of landscape architecture). Where formatting and styling options were available, the 1:1 format and photographic style were chosen. The results are shown in Figure 1.



a. Crayion v3 b. Freep!k Pikaso c. Pixlr d. DeepAI

e. Kandinsky 3.0 f. NeiroPlod g. Shedevrum

Figure 1. Outputs obtained by generating the text prompt with different AI image generators.

Regardless of personal preferences and taste which may ultimately influence the choice of one platform over another, it should be noted that the only significant deviation from the prompt is represented by the image generated by Deep AI, which does not include any fountains.

COMMON ISSUES IN IMAGE GENERATION

Working with AI image generators confirmed common issues that have been widely observed by developers, users, and researchers. For instance, in their evaluation of text-to-image models, Lee et al. (2023) highlight the issues presented in Table 2.

In particular, examples of reasoning, knowledge, bias, and alignment issues were detected.

With regard to reasoning, it was observed that in some instances the AI image generators were unable to contextualize the objects, represent their correct number, and match the spatial relations between them in accordance with the textual prompt. Figure 2 provides an illustrative example of the first two issues. The images were obtained by feeding the prompts ‘A group of five students with backpacks’ (2a) and ‘A group of five students with bags and books’ (2b) to Freep!k Pikaso. However, only four of the eight images depict the correct number of students. As previously stated by Mirjalili (2024), AI lacks the ability to conceive abstract quantities, which results in outputs with an incorrect number of items.

Table 2. Common issue in image generating technologies (adapted from Lee et al., 2023)

Issue	Definition
Alignment	Is the image semantically correct given the text (image-text alignment)?
Quality	Do the generated images look like real images/photos?
Aesthetics	Is the image aesthetically pleasing?
Originality	Does the model generate creative images and prevent copyright infringement?
Reasoning	Does the model understand objects, counts, and spatial relations (compositionality)?
Knowledge	Does the model have knowledge about the world or domains?
Bias	Are the generated images biased in demographic representation (e.g., gender, skin tone)?
Toxicity	Does the model generate toxic or inappropriate images (e.g., violent, sexual, or illegal content)?
Fairness	Does the model exhibit performance disparities across social groups (e.g. gender, dialect)?
Robustness	Is the model robust to invariant input perturbations?
Multilinguality	Does the model support non-English languages?
Efficiency	How fast is inference for the model?

Furthermore, the words 'rucksack' and 'bag' were not contextualized in a learning environment. Consequently, a wide range of options was generated, including hiking rucksacks and shopping bags rather than those designed for use at school or university. In addition, some images clearly show an excess of items, too.

a. 

'A group of five students with backpacks'

b. 

'A group of five students with bags and books'

Figure 2. Examples of reasoning issue (images generated using Freep!k Pikaso)

With regard to the misinterpretation of spatial relations, this is evident in Figures 1b and 1c. Despite the clear prompt indicating that the fountain should be centered, there is a deviation in its positioning in both images. In the first instance, the fountain is slightly shifted to the left, while in the second one, it is positioned on the right.

Figure 3 illustrates an example of a knowledge issue. Upon receiving the prompt 'A view of a small walled backyard with a spruce tree on the right side', only two out of the four images generated (the middle ones) appear to accurately represent the shape and texture of a real-life spruce (Figure 4a). The remaining images incorporate other conifer species, most likely a pine (Figure 4b) and a cypress (Figure 4c).

‘A view of a small walled backyard with a pine tree on the right side’

Figure 3. Examples of knowledge issues (images generated using Freep!k Pikaso)

a. Norway spruce (*Picea abies*)

b. Scots pine (*Pinus sylvestris*)

c. Mediterranean cypress (*Cupressus sempervirens*)

Figure 4. Real-life conifers (images from WikiMedia Commons).

Figure 5 presents the outputs obtained when the prompt ‘Students attending a university lecture’ was typed into Freep!k Pikaso. The prevalence of Asian complexion among students is likely a consequence of pervasive stereotypical bias associating Asian-American students with academic excellence, often referred to as ‘whiz kids’ (see, for example, Dmitrieva et al., 2008). The issue of AI adherence to gender and racial bias has been the subject of numerous research papers (Bianchi et al., 2023; Guilbeault at al., 2024).

‘Students attending a university lecture’

Figure 5. Example of bias issues (images generated using Freep!k Pikaso)

Misalignment issues arise when the AI image generator is unable to accurately represent the information provided in the textual prompt. For example, Figure 1d does not include the elements of a fountain and topiary, despite their description in the prompt. Also in Figure 1, none of the generated images appears to include all three types of flowers (tulips, daffodils, hyacinths) that should be featured in the flowerbed.

a. 
'A lawn with three trees: a green tree, a tree with flowers, a tree with apples' (first attempt)

b. 
'A meadow with a tree carrying ripe red apples, a tree with pink blossoms, and a green tree' (second attempt)

c. 
'A meadow with three trees: a first tree carrying ride red apples in the background; a second tree with pink blossoms in the centre; and a third green tree in the foreground' (fifth attempt)

d. 
'A meadow with two trees carrying red ripe apples and a hill with other trees in the background' (eighth attempt)

e. 
'A meadow with two red apple trees and a hill with other trees in the background' (tenth attempt)

f. 
'A meadow with two apple trees and a hill with other trees in the background' (twelfth attempt)

Figure 6. Some attempts at rewording a 'complex' idea (images generated using Freep!k Pikaso)

In the majority of instances, this type of issue can be rectified through rewording or rephrasing. As a general rule, the more detailed the description, the more successful the outcome will be. Nevertheless, in certain cases, even numerous iterations of rewording prove ineffective in achieving an optimal output. That is the case of ideas that can be regarded as conceptually 'complex'. To clarify what is meant by 'complex' ideas, consider the following case: to reinforce vocabulary related to vegetation phases and plant physiology through oral or written description, the author sought to generate an unrealistic image featuring three different trees positioned side by side, with one covered only by foliage, the second in bloom, and the third bearing fruit (more precisely, apples). To enhance the probability of obtaining a suitable output, four distinct images were generated for each prompt.

As the initial seven attempts (including Figures 6a, 6b, and 6c) did not yield satisfactory outputs, the conception of the image was modified to a representation with just two trees, both bearing fruit, beginning with the eighth attempt. However, even in this case, the outputs were not an accurate representation of the prompt. There was a discrepancy in the number of trees depicted, with the term 'red' in the phrase 'red apple trees' sometimes applied not to the apples themselves, but to the trees as a whole. Moreover, the apples were not proportionate and depicted as lying on the ground instead of hanging from the trees (Figures 6d, 6e, and 6f). Ultimately, only after twelve prompts and 47 different outputs, the platform generated an image in which, although the number of trees was once again inaccurate, the apples were at least of average size and hanging from the branches (Figure 6f, second image from the right).

These examples serve to illustrate that obtaining an adequate output is not a straightforward process. When generating images through AI, the most crucial skills to be cultivated are mental flexibility and a proficient command of the language in which the prompts are written, as they are likely to require rewording or rephrasing. Additionally, patience is a vital asset, as the creation of a single image may require multiple attempts.

Another significant issue that must be addressed when dealing with AI is that of authorship and copyright. It is unsurprising that the discussion surrounding AI-generated content (in any of its form, including texts, images, videos, music, and so forth) has been a prominent topic of debate in recent years. Nevertheless, consensus has yet to be reached, with each country adopting a distinct approach to the regulation of this issue. For instance, in both Russia and the USA, the authorship of AI-generated works is currently undetermined because AI itself is considered a mere instrument. This is due to the fact that only physical or legal persons can be recognized as authors and therefore copyright holders. In addition, it is uncertain which individual or entity – the user, the owner, or the programmer – would be the most appropriate candidate for holding copyright. As posited by Abbot and Rothman (2023), the principles of accession, first possession, and work-made-for-hire appear to confirm copyright upon the owner (or the programmer, if the AI system is the result of independent work) (pp. 1196–1197). However, this approach may be perceived as inequitable with respect to the user, given that the owner/programmer was not directly involved in the creative process. In this regard, Orlova (2022) presents an intriguing proposition: delineating a distinction between internal (functional) and

external (creative) outputs of AI technologies. In this scenario, the owner or programmer would be the holder of copyright on internal outputs, while the user would be entitled the copyright on external outputs (p. 215). An alternative approach, endorsed by the European Union, is to establish the concept of an 'electronic' person as a distinct entity, separate from natural and legal persons. However, this perspective has not been widely embraced and gives rise to a range of ethical and legal concerns (Hristov, 2017, pp. 441–442; Orlova, 2022, pp. 211–212). Ultimately, as copyright is transferable, the question of who should be the rightful copyright holder to AI-generated works may be resolved through the establishment and signing of an agreement between the parties involved (Abbot & Rothman, 2023, p. 1198–1199).

ELABORATING TEACHING MATERIALS WITH AI-IMAGES

As previously stated, AI images can be utilized as a tool to create teaching materials such as textbooks, worksheets, and handouts, enhancing their effectiveness by integrating visual elements. For instance, the exercises included in the author's textbook were designed with the primary objective of facilitating vocabulary building and boosting activities. Some of the generated images were also integrated into reading and listening comprehension exercises, as well as writing and speaking activities.

Figures 7–9 present vocabulary-focused exercises, in which students are required to fill in the blanks in the text by referring to the images.

The picture shows a big ___. Plant life is ___, as we can see the leaves of many ___ ___ (though they haven't flowered yet) and luscious ___ near the edges. A beautiful ___ tree is towering on the right, surrounded by rocks and ___. Behind some ___ on the background, we can see the red roof of a ___ surrounded by trees.

Figure 7. Open cloze (image generate using Freep!k Pikaso)

Figure 8. Open cloze with initial letter (image generated using Freep!k Pikaso)

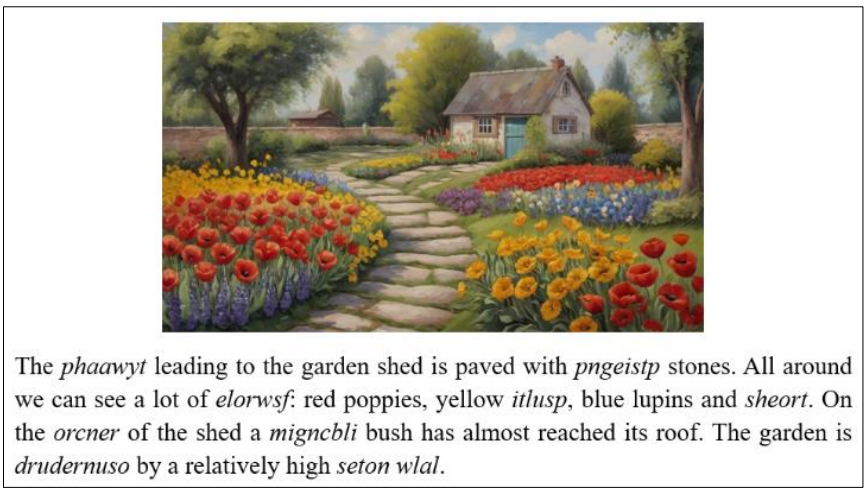


Figure 9. Unscramble the words (image generated using Freep!k Pikaso)

In the context of reading comprehension activities, AI can be employed to generate images that must be labeled with words from a text, as illustrated in Figure 10. This same type of exercise can also be effectively applied in listening activities.

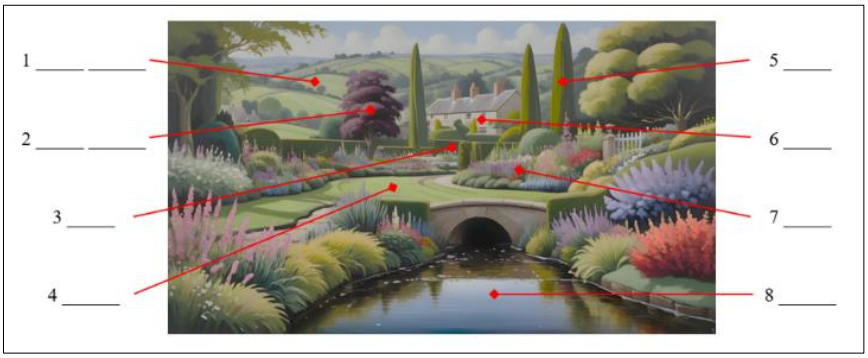


Figure 10. Labelling (image generated using Freep!k Pikaso)

The use of AI-generated images instead of definitions in crosswords represents an effective strategy for vocabulary reinforcement (figure 11), particularly among students majoring in Landscape Architecture, since the visual representation of architectural features, flowers, plants, colors, and other elements is often more readily comprehensible than their verbal description.

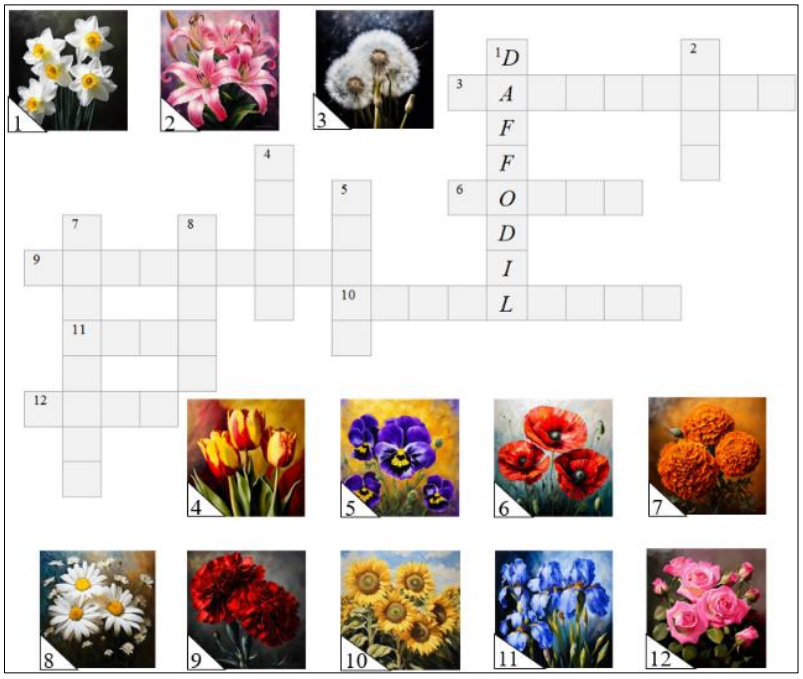


Figure 11. Crossword (images generated using Kandinsky 3.0)

Ultimately, a series of images were generated and incorporated into the textbook with the objective of improving the learners' writing and/or speaking skills through the description of the images themselves employing specialized vocabulary. For instance, Figure 12 was utilized in the chapter dedicated to ancient Greek and Roman gardens.

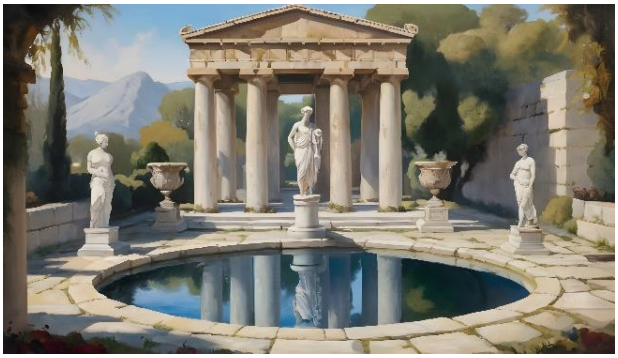


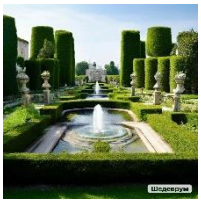
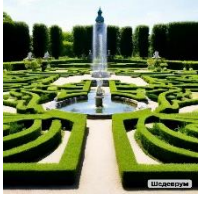
Figure 12. Image for description (generated using Freep!k Pikaso)

AI-IMAGES IN THE CLASSROOM

In addition to generating images that can be integrated into textbooks and other teaching materials, AI image generators can be effectively integrated into classroom activities where the students are encouraged to utilize the generators. This kind of activity can be considered a form of learning through play, as it facilitates not only the acquisition of specialized vocabulary and the development of language skills, but also stimulates students' creativity, fosters communication among them, and allows them to engage in enjoyable activities. Moreover, the incorporation of a different and creative activity in the middle of a lesson may prove beneficial in recharging the attention span of the learners, effectively distracting them from more conventional tasks such as reading, doing grammatical or vocabulary-oriented exercises, or listening to the teacher's explanation.

From a practical standpoint, Shedevrum represents an excellent tool for the introduction of AI image generators in the classroom. The smartphone application can be initially downloaded and installed in a matter of seconds, and subsequently accessed at any given moment. Furthermore, the user interface is designed to be intuitive and engaging, reminiscent of a social media platform. Most notably, it is capable of rapidly generating images, with a ratio of two images produced in approximately 10 seconds. To share the outputs of their image generation sessions, the teacher may create a group chat where students upload the obtained outputs, enabling the assessment of whether the educational objectives have been achieved and the provision of feedback. Furthermore, the group chat can be also used as a catalyst for either free or guided discussion among students, encouraging them to compare and evaluate the generated images, identify their merits and shortcoming, and provide constructive feedback to one another.

Table 3. Post-reading activity (all images were generated using Shedevrum v 1.3)

	Prompt	Output
Student 1 (female, 19)	*A view of [a] charming Italian garden starts from high green walls. We're surrounded by sculpted hedges that are combined with flowerbeds of roses and other seasonal and perennial plants. Delightful mazes bring us to the 'secret garden' where people can relax on fascinating benches in the surrounding of vegetation, statues and shrubs which obtained their form with help of topiary art. Then, we can see a fountain and elegant canals.*	
Student 2 (female, 19)	*The view of a lovely Italian garden is a quiet, secluded place surrounded by a hedge. Sitting on a bench, we can see topiary bushes and vases of flowers and a view of a beautiful pond. The pergola above us shelters us from the sun. This geometrically smooth picture is diluted with sculptures.*	
Student 3 (female, 21)	*A view of an Italian garden opens up. There are a lot of geometric shaped bushes, trees and hedges. Also, there are animal and human shaped bushes. In the centre of the garden, we can see a fountain with a statue, which is also geometric shaped. The whole picture creates [a] festive and delighted atmosphere, [the] garden looks beautiful and very neat.*	

The first type of classroom activity was designed as a follow-up to a reading comprehension activity. After reading a text, students are tasked with envisioning a representation of the information presented in it and generating the corresponding image. For example, following the reading of a text about Italian gardens, which included a comprehensive analysis and description of the distinctive elements of this gardening style, the students were asked to imagine themselves in a typical Italian garden and to describe what they saw around them. Some of the resulting images are presented in Table 3, which also includes the prompts formulated by the students (non-significant changes to their original formulations are enclosed in square brackets).

Image-generating technologies can also be integrated into classroom activities through the generation of replicas of the images given. In this scenario, students are presented with an AI-generated image and are required to formulate their own interpretation of the text prompt used to generate it. Afterwards, they are encouraged to generate their own images and to assess the degree of similarity between these and the original output. For instance, the image in Figure 13 was generated using the prompt 'View of a patio with garden furniture on the left, flower vases on the right, and a pergola with a climbing vine; the garden is surrounded by green hedges.' Table 4 presents a selection of the outputs generated by students through replicate generation, along with the prompts utilized.

Table 4. Outputs obtained through replicate generation (all images were generated using Shedevrum v 1.3)

	Prompt	Output 1
Student 1 (female, 19)	*A view of [the] patio of this Italian garden presents an intimate space which is surrounded from hedges and [a] pergola. Guests can take a cup of tea at the coffee table. Next to this there [are] some pitchers with fascinating white flowers and other plants. From this point of view there's a continuation of maze that includes examples of using topiary art. Sculpted shrubs and flowerbeds highlight [a feeling] of order and calm.*	
Student 2 (female, 19)	*The view shows us a beautiful Italian garden. In the background we can see a hedge with ornamental plants and bushes. Further, [the] picture presents us a pergola and a minimalist table. In the foreground we can also see a hedge. The garden itself gives a feeling of privacy and tranquillity.*	
Student 3 (female, 21)	*A view of a beautiful green garden opens up. In the front, there is a seating spot with a table and chairs. On the table you can see a vase with pink flowers. This table is in the middle of a corridor of plants. In the background we can see neatly trimmed, geometric shaped bushes. Above everything, there is [a] pergola with climbing plants. The whole picture creates [a] calm and even mysterious atmosphere, it feels like you are hiding in this garden from all [the rest of] the world.*	

Figure 13. Image given to students for replicate generation (generated using Shedevrum v 1.3)

An additional approach to integrating image-generating technologies into classwork is through the incorporation of such technologies into more traditional games, such as ‘consequences.’ In this game, participants are prompted to create a short story by responding to a series of questions. The first student writes their answer to the initial question, then conceals it by folding the paper, and passes it to the person sitting next to them. In a conventional game of consequences, the final participant in the process unfolds the paper and reads the story aloud. As an alternative, the last student may opt to generate an image using AI and show it to their course-mates, who are then tasked with guessing the full story. For instance, students were asked the following questions: ‘Who?’, ‘What are they doing?’, ‘With whom?’, ‘Where?’, and ‘When?’ To reinforce the use of specialized vocabulary, they were instructed to utilize an action verb related to gardening. Figure 14 illustrates the image generated by one of the students in response to the prompt, ‘Super Mario / is planting roses / with the Cheshire Cat / at Hogwarts / on Christmas.’

Figure 14. Image based on a game of consequences (generated using Shedevrum v 1.3)

Among the numerous advantages of this type of classroom activity, the incorporation of image-generating sessions utilizing AI technologies can enhance the level of comprehension of complex texts by supplementing them with visual elements. Furthermore, encouraging students to compose their own text prompts facilitates the refinement of their descriptive abilities, attention to detail, and overall writing skills. In addition, as previously stated, the generated images can serve as a topic for either free or guided discussion among the students. Finally, being a form of learning through play, the utilization of AI image generators can provide a relaxing and enjoyable interlude within the context of a lesson. This can assist students in recharging their attention span while utilizing this brief interruption from more conventional classroom activities in a productive and beneficial manner.

CONCLUSIONS

As AI technologies become increasingly integrated into our lives, it is crucial that the educational system identifies strategies to incorporate these technologies into the educational process itself.

The current research has demonstrated that even free and open-source platforms provide a wide range of options to align with personal preferences and meet individual needs, with the majority of outputs meeting expectations. It is evident that, as implied by the relative novelty of text-to-image AI technologies, there is still place for improvement. Nonetheless, AI image generators have proven to be a useful educational tool.

In particular, AI image generators are an excellent resource for creating images that can be integrated in textbooks, worksheets, and other teaching materials to assist students in memorizing and reviewing grammatical structures and specialized vocabulary units in a more efficient manner. In this regard, AI-generated images can be successfully integrated with more conventional types of exercises, such as open cloze, true or false, find the word, unscramble the word, crosswords, and so forth.

Furthermore, image-generating technologies can be integrated into the educational process within the classroom, enabling students to further develop their language skills, stimulating their creativity, encouraging group discussion, and allowing them to practice or repeat while simultaneously engaging in enjoyable activities.

When approaching this kind of technology, it is essential for teachers to be aware of the potential issues that may arise when generating images through AI. To this end, it is crucial for both the teachers themselves and their students to receive training in rewording and rephrasing, with the aim of ensuring that text prompts are as clear as possible. Furthermore, it is important to recognize that artificial intelligence may not be able to fully comprehend the intended meaning.

The potential applications of AI technologies and AI image generators in language learning are numerous and will continue to expand with the rapid advancement of these technologies. Consequently, the topic merits further investigation.

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