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"I learn better with Dall·E": Using Prompts for Self-regulation of Learning with Primary Education Pupils

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Abstract
The proposed chapter examines the implementation of DALL·E3, an image-generating AI, as a tool for self-regulation of learning in Primary Education. This innovative methodology involves students in the creation of specific prompts to generate images, reflecting their conceptual understanding and application of knowledge. The process starts with instructing students on prompt formulation, reflecting their topic understanding. These prompts are input into DALL·E3, which then generates images based on these instructions. Analyzing these images helps students identify misunderstandings or learning gaps. The technique assumes that the clarity and accuracy of a student's prompt indicate their understanding level. This methodology incorporates constructivist learning theory, emphasizing active knowledge construction by the learner. By employing DALL·E3, students not only apply their knowledge but also partake in inquiry-based learning, exploring word-image relationships

and abstract concept representation. A pilot study with Primary Education students from Seville (Andalusia, Spain) gathers qualitative data to assess this tool's effectiveness in improving self-regulation and conceptual understanding. Results indicate an enhancement in students' learning self-regulation and motivation. The chapter also explores the pedagogical and ethical implications of using AI in educational contexts, highlighting both potential benefits and challenges. This research aims to provide insights into the use of emerging technologies in education and suggest directions for future research.

Keywords: Artificial Intelligence, DALL·E3, self-regulated learning, Primary Education, learning situation.

14.1. Introduction

This chapter describes a qualitative research experience incorporating the innovative technology DALL · E3 in the teaching of Primary Education. This Artificial Intelligence (AI) tool allows students to explore academic concepts through the generation of images from their textual descriptions (prompts), combining creativity and the interpretive capacity of natural language. The chapter reveals how this technology is integrated into the curriculum, enhancing visual learning, and stimulating student participation, which takes a central role in their learning process.

Through case studies, the literature review examines the effectiveness of this tool in promoting digital literacy and self-regulated learning. The chapter concludes with a series of conclusions and practical implications for the use of DALL · E3, providing an enlightening perspective on the challenges of incorporating AI tools into teaching. This narrative is an essential contribution for teachers interested in understanding and "navigating" the incorporation of emerging technologies in the Primary Education classroom.

Introduction to generative AI in education: DALL·E3

Generative AI, exemplified by advanced technologies such as DALL · E3, is marking an era of significant change in the field of education. These technologies are not only introducing new possibilities in terms of content and teaching methodologies, but they are also reshaping the way children learn. Aktay (2022)

delves into how these AI tools offer novel teaching and learning methods, highlighting their ability to adapt and personalize the educational experience. On the other hand, Cao & Dede (2023) explore the dynamics of these technologies in the educational context, arguing that generative AI can act as a catalyst for more interactive and participatory teaching strategies.

In addition, generative AI has been shown as a potential element to significantly enrich student engagement and learning, offering a more engaging and person-centerd approach (Siegle, 2023). The work of Vera (2023) and Gómez (2023) addresses how these technologies can transform pedagogical strategies, proposing a shift towards more creative and less traditional approaches to education. This shift is supported by the technical ability of generative AI to provide more personalized educational experiences tailored to students' individual interests and abilities (Fahimirad & Kotamjani, 2018).

Text-to-image AI has undergone a substantial shift in recent years with the launch of programs such as DALL·E3. These are AI models that combine linguistic comprehension with sophisticated visual capabilities. To generate the images, they use a two-stage approach. In the first, the model processes and encodes the textual descriptions or 'prompts'. In the second, it uses this encoding to generate visual images that closely correspond to the given description (French et al., 2023).

In this study, we focus on DALL·E3, (developed by OpenAI), whose main characteristic is the ability to interpret complex and abstract concepts provided in the text, creating visually appealing images that are highly faithful to textual prompts (Li, 2022). This makes it a powerful tool for creative exploration. The flexibility and precision of DALL·E3 open up new possibilities for teaching and learning in creative disciplines, pushing the boundaries of artistic expression (Stokel-Walker, 2022).

Generative AI: some examples of its application in schools

Generative AI offers novel teaching-learning methods that contribute to educational innovation. It has been shown to be particularly effective in formulating prompts for image generation. This application has been evidenced by Dehouche & Dehouche (2023), who have explored its potential in the context of visual

art education. It stands out for its ability to inspire creativity and offer novel visual tools, thus facilitating a deeper understanding of the concepts studied at the curricular level. In addition, French et al. (2023) and Lee et al. (2023) have extended its use to other educational settings. In the first research, they addressed its application in the development of educational games. They suggest that generative AI can enrich the learning experience in games, providing more complex and adaptive scenarios and graphics that respond to students' needs and abilities. This customization capacity improves student *engagement* and encourages deeper learning. On the other hand, Lee et al. (2023) explored the integration of generative AI in STEAM (Science, Technology, Engineering, Art, and Mathematics) classes. Their work demonstrates that AI can foster analytical and creative thinking in these areas, offering students tools to explore concepts and solve problems in innovative ways. Finally, Gattupalli et al. (2023) argue that AI can offer new perspectives in mathematics teaching. Their work suggests that generative AI can be used to create personalized mathematical problems and scenarios, adapting to students' skill and comprehension levels. In summary, the application of generative AI in education offers multiple benefits, including enhancing creativity, personalizing learning, and encouraging critical thinking.

Pedagogical impact of generative AI: a revolution in didactics?

Generative AI is now an emerging field that transforms instructional design and student learning (Xu & Ouyang, 2022). However, many teachers still do not know how to make a pedagogical use of it in order to have a positive impact on teaching-learning processes (Zawacki-Richter et al., 2019).

The teacher becomes a guide, facilitator, and collaborator throughout the process (Salas-Pilco et al., 2022), leading to a remodelling of teacher-student relationships. AI does not replace the teacher; it is one more resource that contrasts with the environment of a conventional classroom where the educator plays an authoritative role in the planning and timing of teaching in most contexts.

Students are no longer passive recipients of knowledge and are allowed to take the initiative in constructing it from a more

situated/real learning approach (e.g., The city is no longer unique, it is not the one that is represented on page "x" of the textbook. The city is now the one that the student creates from their mind). In accordance with cognitive constructivism, students are expected to actively engage the knowledge acquired and form novel conceptual structures on top of those already existing in their minds (Xu & Ouyang, 2022).

The classroom should become a space where humans and technology live intertwined in search of a more sensitive, fair, and sustainable educational process. Along these lines, Berson & Berson (2023) highlighted the democratizing potential of generative AI, arguing that it can facilitate more equitable access to education. It has the ability to personalize learning and provide adaptive teaching materials that respond to individual student needs, which could help close educational gaps and promote more inclusive education (Rodríguez-García et al., 2020).

Generative AI as a strategy for self-regulation of learning

In the contemporary field of education, the integration of AI into the process of self-regulation of learning represents a significant advance, marking a paradigm shift in how learning is facilitated and assessed. Self-regulation of learning, defined as the ability of students to direct and control their own learning process through self-assessment, goal setting, and strategic implementation of learning techniques, is crucial in the development of autonomous and competent learners (Zimmerman, 2008).

The study by Molenaar et al. (2023) highlights that AI, using multimodal and multichannel data, can measure and facilitate self-regulated learning. This approach allows for a more accurate and personalized assessment of the students' learning process. AI's ability to process large volumes of complex data in real-time enables a more adaptive and individual-centered educational response. On the other hand, Wang & Lin (2023) addressed the use of AI to analyze self-regulated learning from a human-centered perspective. Their approach underscores the importance of understanding self-regulated learning not only as a cognitive process, but also as an affective and social phenomenon. Finally, the work of Jones & Castellano (2018) provides a practical example of how AI, in the form of adaptive robotic tutors, can be

applied in the educational context to support self-regulated learning. In their research with primary school children, they show that robots can act as facilitators in the development of self-regulation strategies.

Overall, the literature shows the diversity of applications and the transformative potential of AI in the processes of self-regulation of learning.

In the light of the review carried out, we set two main objectives:

- OBJ-1. Exploring the potential of DALL·E3 in Primary Education.
- OBJ-2. To analyze children's attitudes towards the incorporation of this innovative technology.

14.2. Methodology

This experience responds to a collaborative research model, involving the teacher and students as active participants in the whole process (co-investigators) (Campbell & Lassiter, 2010).

Participants

The sample consisted of 25 students in the first year of Primary Education, with 12 boys and 13 girls aged between 6 and 7 years. These students are characterized by their dynamism, curiosity, and a remarkably positive attitude towards learning. Their disposition towards educational activities is proactive, showing a special interest in those that involve interaction and teamwork, which reflects the cooperative ideology of their school. Two participants had special educational needs and received support to facilitate their inclusion.

Information collection and data analysis

The study was carried out during the usual class hours, and the teacher adopted the role of co-researcher with the rest of the researchers of the university. The collection of information was organized in three sessions and took place during the month of

November 2023. Specifically, the efficacy of DALL · E3 was evaluated in the context of the subject of Knowledge of the Natural and Social Environment, which is taught in English under a bilingual program. At that time, the teacher was developing a learning situation focused on the differentiating elements of 'City' and 'Village'.

The sample of students was divided into five heterogeneous groups; they were asked to discuss the most important elements of a city, and then create a detailed description that would be used as a prompt in ChatGPT. The exercise consisted in each group drawing up a list of essential elements for a city, which would be included in a DALL · E3. The initial prompt, formulated by the teacher, was: "We are a first-grade class. We want an image of a city with the following elements: [...]". Each group added the concepts they had learned during the development of the Learning Situation.

Data collection was carried out as follows in the three stipulated sessions:

- **First Session**. The activity was introduced, and the groups were formed. The students discussed and agreed on the elements they wanted to include in their cities. The, the session was focused on the initial brainstorming and creation of the prompts for DALL · E3.
- **Second Session**. The students received the images generated by DALL · E3 and compared these representations with the examples of cities in their slides and textbooks. They identified areas for improvement and made a second correction to their prompts.
- **Third Session**. The session was focused on an in-classroom interview, where the students reflected on the learning process and expressed their opinions on the effectiveness of DALL · E3 as an educational tool. This session allowed us to gather detailed insights into the students' learning experience and their interaction with technology.

At the end of each session, the research group met to analyze the events and make the necessary modifications in the following sessions.

Participant observation in the classroom and audio recordings of the sessions were essential for their subsequent analysis.

The ten productions (cities) created by the students, together with the discourses generated during the creation process with DALL·E3, were analyzed to evaluate the effectiveness of the tool in the educational environment. This multifaceted approach provided a comprehensive understanding of the tool's impact on students' self-regulation of learning.

The children's participation in the research was voluntary and followed the ethical requirement of informed consent. At all times, the internal regulations of Social Sciences required by the Ethics Committee of Experimentation of the University of Seville were followed.

14.3. Results

Potentiality of DALL·E3 in knowledge of the environment (Objective 1)

In this research, the potential of DALL·E3 was assessed in the educational context, specifically in the subject of Knowledge of the Natural and Social Environment. Through the generation of images based on descriptions supplied by first-grade elementary students, we sought not only to understand AI's ability to create images that reflect learned concepts, but also to examine children's attitudes towards this emerging technology.

Based on the initial ideas that the students had demonstrated in class about the elements of the city and the town, the teacher created the following prompt: "We are a first-grade class. We want an image of a city with the following elements: [...]". Each group of students completed it with the concepts they had studied during the Learning Situation, resulting in five different images of cities (one per group).

Figure 14.1 shows a city closer to the image of a village, which made the students make observations such as: "the houses are very small", "there are many plants". This occurred as the group placed greater importance on items such as trees, houses, and fountains. It is considered that the group made a poor prompt of content, since they forgot other concepts learned during the Learning Situation closer to the image of an industrialized city such as factories and skyscrapers.

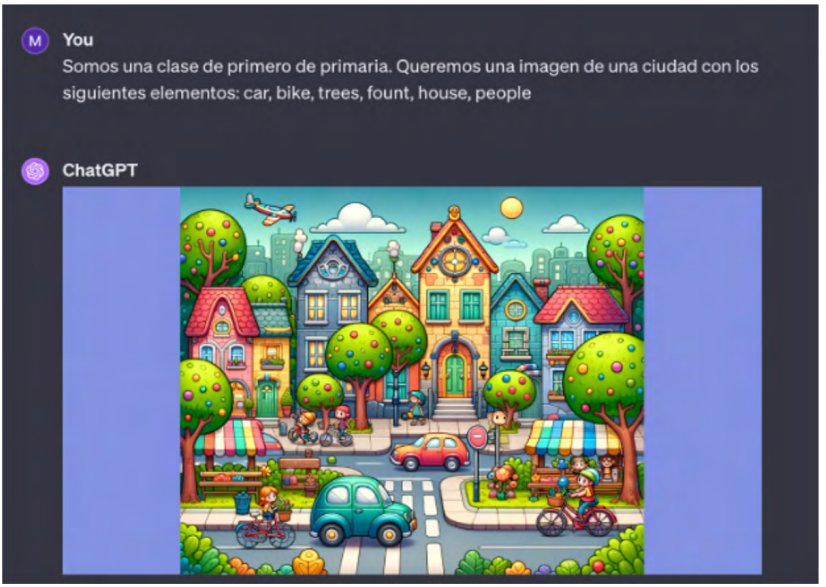

Figure 14.1. A city created from a deficit prompt. Source: developed by authors.

In the first attempt of each group, the results did not correspond to the idea of the city that they had, thus they were willing to try to improve: "We want to do it again, please", "We have to put a hundred cars to make it like Seville", "The houses are very small, like in my grandmother's village. The ones in Seville are bigger."

By making the corrections in a new prompt, through the addition of more concepts studied in the unit, the AI provided results closer to the students' concept of the city (Figure 14.2).

In some cases, as can be seen in Figure 14.2, the image had imperfections, such as the appearance of "birds" with strange shapes, which gave rise to debate: "The aliens have invaded the city", "The city is so cool! Let's see if there are aliens in ours too." Talking with the teacher, the students understood that, in order to create a realistic city, they could improve this prompt by indicating "Let the city be real, of this world", "Let the monsters be birds so that it is real".

However, the students were able to understand at all times that they were in front of cities, working on the concepts of the unit: "There are many cars", "There are traffic lights in the street", "There are many people", "The buildings are already big, they

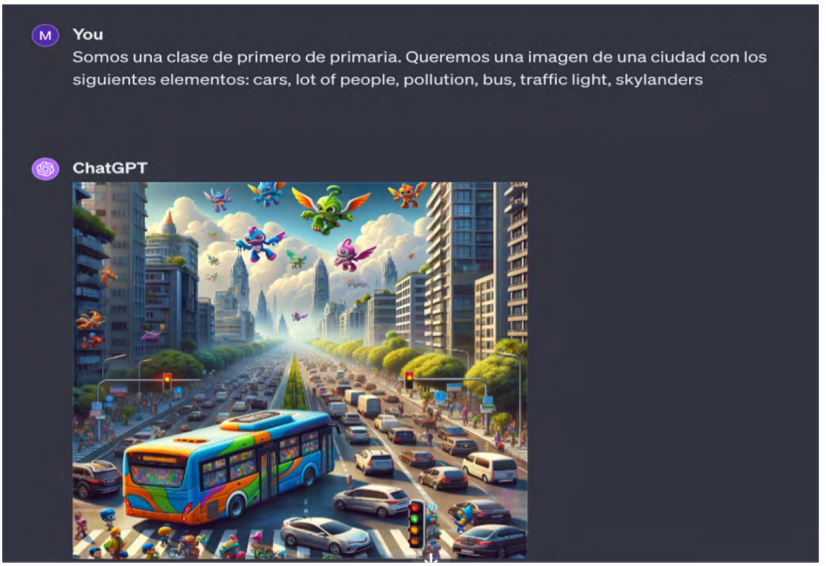

Figure 14.2. City created from a proper/complete prompt. Source: developed by authors.

weren't before", "The trees are like those in Seville", "The street is very big, it looks like the one next to the Betis stadium".

Students' attitudes towards the use of generative AI (Objective 2)

The introduction of DALL·E3 in the educational environment was shown in our study to be a valuable tool to promote self-regulation of learning among students. The results show that this form of AI goes beyond simple visual reproduction, prompting students to take a more active approach to their education. The class tutor comments: "The students have been more willing to explore for themselves without asking me many questions, which helps them to learn in a more autonomous and effective way."

The enthusiasm that the practice generated among the students is a clear indicator of its potential as a pedagogical resource: "Teacher, it's super cool to see how the city is being built with what we are telling you," said one student, reflecting the tool's ability to capture the attention of children. Another child

added: "I like using it, because I can make my real city [...], the city of the book is not my city." These reflections show the capacity of DALL·E3 to motivate students, encouraging their autonomous learning by focusing the content on elements that are familiar to them.

The experience of working with DALL·E3 showed that the imaging process is just as valuable as the final images themselves. The difference between what the students expected and what the AI produced opened up a space for them to reflect on their thinking and way of solving problems. The tutor observed: "The discussion that arises when the images do not match their expectations gives rise to a learning opportunity."

14.4. Conclusions and Practical Implications

The results obtained in the present study underline the significant potential of AI, particularly tools such as DALL·E3, to enable teachers to transform and enrich the educational environment. It was demonstrated that AI not only serves as a resource to complement the work of teachers, but it also enriches the learning process of students by facilitating an active construction of knowledge. The ability of this tool to promote self-regulation and inquiry-based learning highlights its pedagogical value, encouraging students to take a more active and focused role in their own learning process. This autonomy and personalization of learning manifests itself in greater motivation and empowerment among students.

In addition, the use of tools such as DALL·E3 demonstrates a sensitivity to cultural diversity, allowing students from different backgrounds to see themselves reflected and to integrate their environment and personal experiences into learning. The possibility of personalizing teaching-learning processes and conducting formative assessments in real time represents a significant step towards inclusive education. This approach not only improves students' commitment to their educational process, but also fosters a fairer and more equitable learning environment, where each student can progress according to their abilities and needs.

The tutor stressed that the use of DALL·E3 in the classroom should focus on stimulating students' imagination and curiosity

rather than chasing the generation of hyper-realistic images. This approach aligns with the perception that technology should serve as a catalyst for creativity and not just as a tool to replicate reality. For this reason, no major effort was made to refine or alter the prompt that led to the creation of Figure 14.2. However, at higher levels of education, where students have greater autonomy and ability to construct their own descriptions, it would be convenient to guide them towards the creation of prompts that more accurately reflect the structures and organization of a city.

The integration of AI tools in education also poses significant challenges that must be addressed to maximize their potential. The need for adequate teacher training, equitable access to technology, and adaptation of curricula are crucial aspects for successful implementation. In conclusion, this study underlines the importance of expanding the educational experience with AI to other courses and contexts, encouraging students to design their own prompts and actively participate in their learning process. The adaptation and expansion of these tools at different educational levels and areas of study is essential to prepare students for a digitalized future, fostering a more personalized, inclusive, and adaptive education to cover the needs of the 21st century.

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