

The Apprentice Copilot

The Untapped Potential of Using Generative Artificial Intelligence by Design Students

Short Paper

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Abstract—This research is part of an investigation into the use of Generative Artificial Intelligences (GenAI). Through a case study, we analyze both the use and abstention of these tools by students in the creative area during the resolution of a graphic challenge. The study underscores the importance of developing skills in emerging technologies to foster innovation. The central question explored is how GenAI tools are employed in the co-creation process and the development of design solutions. The main findings indicate that, despite their potential to act as copilots in the conception and creation process, these tools are still underutilized by students in this specific case study.

Keywords-Generative AI; Artificial Intelligence; Hackathon; Creative Industry; AI Copilot.

I. INTRODUCTION

In recent years, Generative Artificial Intelligence (GenAI) has been significantly reshaping workflows across a wide range of economic sectors. Its ability to assist in creative processes and problem-solving has provided new opportunities for exploration, particularly in education and design. Therefore, this research aims to investigate how students utilize GenAI as an innovative tool to address and solve creative design challenges. This article presents a detailed case study [1] of a hackathon-style event conducted as part of a digital innovation project course within the Bachelor's Degree in Design at the Federal University of Santa Catarina (UFSC). The participants, fifth-semester Design students, were divided into five groups of two. Each group faced the challenge of delivering two graphic solutions: one created using traditional methods and another incorporating Generative AI tools.

The event was designed to examine how students incorporated generative AI tools into their creative processes, evaluated whether these tools supported or hindered their workflows, and understood their perceptions regarding this integration. To facilitate a

consistent analysis, both stages of the challenge were based on the same theme. The central focus aligned with the United Nations' 13th Sustainable Development Goal: Climate Action. Students were tasked with addressing the question, "How can we promote awareness about the preservation of the Amazon Rainforest?"

As part of the event, students created an image to represent a solution to the proposed challenge. A jury evaluated the submissions using predefined criteria (outlined in the Methods Section) to select and award the work that best addressed the challenge. The first 50 minutes of the activity were dedicated to solving the challenge exclusively using traditional methods, which the students were already familiar with, without the assistance of GenAI tools. After a 10-minute break, the participants resumed the same challenge for an additional 50 minutes, where they were allowed to incorporate GenAI tools at any stage of the process, from ideation to final design.

This research explored how GenAI tools were integrated into students' creative processes and their impact on design outcomes. To address this matter, a Case Study methodology was employed (as detailed in the methodology section) to examine qualitative data gathered through a structured form completed by the participants. The goal is to analyze the experiences, perceptions, and outcomes reported by the students, providing an understanding of the factors that contributed to the success or failure of the event's challenges. The paper is structured as follows: In Section II, we present the theoretical framework underpinning our study, exploring prior research related to AI in the creative process. Section III details the methodology employed, including the research design, data collection, and analysis techniques used to gather and interpret the data. In Section IV, we provide a comprehensive analysis of the results, discussing the implications and significance of the

findings. Section V addresses the limitations of our work. Finally, Section VI presents our conclusions.

It is important to emphasize that this study is inherently qualitative, and its findings cannot be generalized or used to establish a definitive consensus on the use of AI-generated tools by students. Rather, they represent the initial phase of an effort to investigate these applications. In this sense, the sample of 10 students serves as a pilot experiment, enabling future studies to be replicated or refined based on the format adopted in this initial approach. Thus, we advance the discussion on the uses and non-uses of these tools, expanding our understanding of their implications and possibilities.

II. THEORY

AI tools have increasingly been used in the design and creative industry, focusing on content creation, information analysis, content enhancement, information extraction, and data compression [2]. It has also been transforming visual processes through creating concepts, styles, and aesthetics [2].

AI tools that generate images, also titled “text-to-image”, such as Midjourney, Adobe Firefly, and DALL-E have been investigated in the field of design for their specific applications in image creation. Recent literature shows that these models are capable of producing highly realistic and aesthetically pleasing images demonstrating significant potential for aiding in artistic creation and productivity, making content creation more accessible to non-specialized users [3]. Certain text-to-image GenAIs are positively rated on user experience (UX) metrics, such as ease of use and intuitive design [4]. As Artificial Intelligence plays a significant role in culture in general by assisting in aesthetic decision-making related to media creation [5], these AI tools are particularly relevant for content creators and creative fields.

The literature also presents different cases within creative domains especially in design [6][7], art [6][8] and architecture fields [9]. However, while investigations within creative industries and professional contexts presents insights over increased productivity and enhanced creativity [10], studies on the impact of AI focusing on students in creative areas seem comparatively less researched. Moreover, considering the recency of Generative AI, there is still considerable scope for further investigation. Among recent studies focusing on students, investigations about the satisfaction with the results generated by GenAI tools suggests that they need significant improvements in usability and positive emotional resonance to meet the expectations of future designers [4]. Other studies assert that Generative AI tools can enhance the creativity and aesthetic capabilities [11] and reduce the cognitive load of design students [12].

III. METHODS

This research constitutes a case study [13] and adopts a fundamentally qualitative approach to understand the subject matter. The primary instrument for data collection

involved the use of structured questionnaires, designed to capture comprehensive feedback about the event. The questionnaires were administered to participants following the event. To enrich the depth of the discussion, the data collected through these questionnaires were further supplemented by the researchers' participant observation to provide contextual insights that were not captured through the questionnaires alone. Additionally, document analysis of the jury's evaluations was conducted, to enhance the robustness of the findings. The event thus included the participation of students, mentors, and the jury.

At the beginning of the Hackathon challenge, participants were provided with basic instructions regarding the deliverable. The deliverable format consists of two submissions per group: one developed using GenAI and the other developed solely with traditional design methods and tools, at the participants' discretion. Therefore, students were allowed to use any software tool to create, as long as it did not incorporate any AI functionalities for the first challenge. For the second challenge, various AI tools were suggested to assist the students, including Adobe Firefly, Copilot, Gemini, Midjourney, Photoshop, Illustrator, and ChatGPT. This way, students could choose at which stages of the design process to use these tools, whether for generating ideas through text or for creating or editing images.

The file format was restricted to JPEG or GIF and only free images repositories or images created by themselves were allowed. The students were organized into five groups, and each group had access to one computer to perform the tasks, with a time limit of one hour for each proposed challenge.

The theme of the challenge was “How to promote awareness about the preservation of the Amazon Rainforest?” for both deliverables. This format enabled direct comparison of deliverables created with and without GenAI, aligning with the United Nations Sustainable Development Goal 13: Climate Action. Fig. 1 represents the challenge that the students were required to use as the main theme for their creation.:



Figure 1. Challenge proposed to Design students.

The jury, composed of three individuals, including two designers and one advertising professional, consisted of

two doctoral students and one master's student. They assessed the materials in a separate room using a Google Forms questionnaire. The evaluation interface categorizes the projects according to three criteria, with scores ranging from 1 to 5, where 1 is the lowest and 5 is the highest, as follows:

Originality and innovation: Evaluation of the uniqueness and creativity of the approach to the theme, whether the proposal offers new perspectives or unconventional solutions to the challenges faced by the region, using novel or underexplored technologies or concepts.

Visual communication: The visual composition of the solution, if it tells an engaging and informative story about the theme. Observation of the ability to convey a clear and persuasive message through visual elements, layout organization, and use of colors.

Clarity of the message: Evaluation of the clarity with which the solution communicates its main message or call to action regarding the theme, whether the message is easily understandable, direct, and capable of mobilizing the audience for the cause, avoiding ambiguities and ensuring that viewers comprehend the objectives and importance of the challenge.

Additionally, to ensure an impartial evaluation of the relationship between participants and jury, the teams and the deliverables were anonymized. Works were submitted to the judging panel under randomly assigned letters from A to J. The jury was not informed about which deliverables were created with the use of AI. This decision was made to ensure impartiality in the evaluation process, allowing the jury members to assess each submission based on the pre-defined criteria.

Participant observation, conducted by the researchers, also formed part of the conclusions in the study. This approach offers the observer the opportunity to avoid solely perceiving elements that conform to their implicit or explicit hypotheses, thus leading to a genuine questioning [13]. Therefore, by exploring the significance and utilization of the elements and distinguishing its applicability, the observers improve their analytical framework [13]. In this context, the researchers were able to identify how the AI tools were used and not used by the students, which significantly influenced the final product outcome.

After the event, the instrument for collecting qualitative data from the students was distributed. This collection tool consisted of seven questions, the answers to which will later be discussed in relation to the experience of the event. In conclusion, the participant observation experience complemented the qualitative analysis of the data collected through the forms. Specific aspects observed, such as the decision to not use AI tools to generate content at certain stages of the process, were highlighted and later clarified by the students in the forms.

To evaluate the students' previous understanding and use of Artificial Intelligence, we administered a pre-hack questionnaire at the start of the course, which included two targeted questions related to the upcoming activities. Students were asked whether they had any experience with Generative Artificial Intelligence for creating and editing images and, if so, to specify which AI tools they had used. The AI tools mentioned included Midjourney, Canva text-to-image, Firefly, Copilot, and DALL-E

IV. ANALYSIS

Based on the responses provided by the students, it was possible to assess their level of familiarity with Generative Artificial Intelligence tools. This analysis revealed initial indications that these tools were still being underutilized. The analyzed data suggests that students may have limited experience about the available tools. Fig. 2 presents a summary of the students' prior experience.

Do you have experience with Generative Artificial Intelligence for creating and editing images?

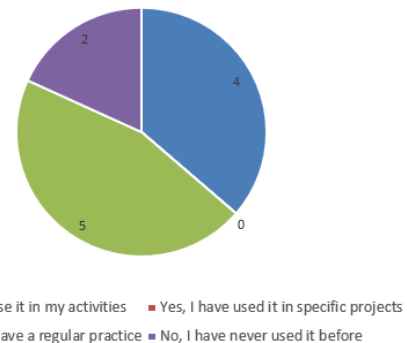


Figure 2. Students' prior experience with GenAI for creating and editing images.

Fig. 3 and Fig. 4 compiled the students' works with and without AI usage, showcasing the diverse creative efforts and perspectives of each group. In Fig. 3, it is possible to observe the images created using traditional methods and tools.



Figure 3. deliverables created by design students, without AI.

Each group focused on different aspects of the challenge. While one group advocates for reducing meat consumption with the slogan “One day without meat, one step for the Amazon” (top left corner), another highlights critical reasons to fight for the forest with “Why fight for the preservation of the Amazon?” (top center). Other groups underscore the destructive consequences of deforestation with slogans like “Keeping what remains standing is not enough” (bottom left corner) and “Destroying the Amazon is destroying our roots” (bottom center). Some of the students submitted static images while one group chose to create a video in GIF format. Comparatively, Fig. 4 contains the five distinct images created with the assistance of AI tools.



Figure 4. deliverables created by design students, with AI tools.

The first image (top left corner) has the text “without preservation, the Amazon will be just a story told in theaters”, created by the same group that had previously made a deliverable in GIF format. For the second challenge, this group decided to create a completely new image with a different approach.

Some groups maintained the same challenge idea for the AI-assisted part, keeping the same slogan, for example the second image (top center), that includes the text “keeping what remains standing is not enough”, the third image (top right corner), with the text “why fight? for the preservation of the Amazon” and the image in the bottom center, “one day without meat, one step for the Amazon”. All of those images were created using Midjourney and Firefly, also edited with “traditional” tools such as Canva and Photoshop.

The fourth image (bottom left corner) has the text “don't let greed destroy the Amazon”, showing hands breaking a tree branch. This image represents a hand-drawn illustration and is particularly noteworthy because the group chose not to use AI text-to-image tools to create it, opting for traditional methods like hand drawing instead. In this case, AI was only used for ideation and brainstorming with ChatGPT.

Each project was scored using the three predefined criteria: Visual Communication, Clarity of Message, and Originality and Innovation. Both the highest-rated project and the one with the lowest score were completed without

the use of AI generation, while the projects with scores closest to the sample average were those created using AI tools. Notably, the project with the highest overall score was the only deliverable submitted in GIF format, whereas all others were in JPEG format. This observation suggests an improvement for future research: the need to establish a standardized deliverable format to minimize potential biases in the evaluation process. Table I represents the average score and the category of each of the project, analyzed by the jury.

TABLE I. TABLE TYPE STYLES

Jury Evaluation					
Code	Visual Com.	Clarity	Orig./ Innov.	Total	Category
C	4.0	3.7	5.0	12.7	Without GenAI
B	3.7	2.7	4.0	10.3	Without GenAI
E	3.7	2.7	4.0	10.3	Without GenAI
D	3.3	3.3	2.7	9.3	With GenAI
H	3.3	3.3	2.3	9.0	With GenAI
G	3.3	2.7	3.0	9.0	With GenAI
J	2.7	3.3	2.7	8.7	With GenAI
A	2.7	3.0	3.0	8.7	With GenAI
I	3.0	2.7	2.7	8.3	Without GenAI
F	2.7	2.7	2.7	8.0	Without GenAI

The work with the highest score, achieving 12.7 total points among the jury members, was done without the use of GenAI. Conversely, the work with the lowest score, also without the aid of GenAI, reached a total of 7.0 points. These results constitute a standard deviation of 0.97, which suggests that the evaluations were relatively consistent.

As mentioned, after the event, a structured questionnaire was submitted to the participants, containing the following questions:

a) *Were you already familiar with generative AI tools for use in design processes? If so, which ones?*

b) *At what stages of the process/challenge did you use AI? Please describe which tools you used and how you utilized them.*

c) *What are the main tools you typically use in your traditional creation processes?*

d) *What were the main challenges you encountered in the task without the use of AI?*

e) *What were the main challenges you faced in the task with the use of AI?*

f) *After completing the challenge, did any new questions arise about the use of generative AI in the design process?*

g) *What did you think of the activity? Please leave your overall feedback.*

The qualitative analysis of the data from this questionnaire, along with the participant observation, provided insights for several key inferences. Firstly, regarding the students' complaints about insufficient time to complete the challenges, participatory observation revealed an acceleration of the process in the initial stages of ideation and drafting. In the final phases, the students showed little interest in exploring new images with the remaining time. Indeed, three of the five groups completed the activity before the initially scheduled deadline. It was also observed that participants had limited knowledge about GenAI tools, with only two of them stating they had prior experience with these types of technologies. The others reported a basic familiarity with some tools, such as Adobe Firefly and Photoshop Beta, but had not effectively used them previously.

One of the main challenges identified both in the questionnaire and in the participant observation was the students' lack of prior knowledge in formulating appropriate prompts for image creation. This specific challenge was also identified in previous literature about GenAI content creation with students, where the need for further research in developing effective prompt strategies is highlighted [14]. For instance, one participant entered the input expecting the GenAI to produce a literal representation of the final challenge result. This approach was also observed in other groups. Three respondents mentioned using ChatGPT to refine the prompts before inserting them into the GenAI. From this perspective, we observed students cannot expect AI tools to produce fully polished results; rather, these creative process outcomes must be refined by human intervention. This also aligns with existing literature that emphasizes the role of AI as a tool or collaborative assistant for creativity, rather than a sole creator of original work [14][15].

Secondly, comments from students, such as "I did not get exactly what I was imagining" and "the images did not turn out as we wanted", expressed in the answers of question 05, illustrate the difficulties encountered in constructing and refining prompts. Similarly, question 06 highlighted their low familiarity with the interfaces of the tools, as expressed in comments, such as "How to use the tool correctly so that it produces art more faithful to the ideas we have" and "I feel I need to practice more with the tools to learn to think about prompts more effectively".

For example, one group stated that Adobe Firefly was used for creating campaign images, while attempts to utilize generative AI within Illustrator for refinement were ultimately unsuccessful, leading to the creation of a new artwork from scratch, supplemented by text from Canva. Another group decided not to use GenAI for the graphic stage of the second deliverable, preferring more traditional tools because they felt more confident in their use. Therefore, this group used ChatGPT exclusively for immersion and idea generation, abstaining from using AI in the creation of the final deliverable.

Overall, participants found generative AI useful for idea generation and structuring, but encountered challenges when using it for final image creation, preferring traditional design methods or tools for achieving desired outcomes. In summary, despite the initial assumption that GenAI is already being used as supportive tools in the conception and creation of graphic projects by students, the results of the experiment indicate that these tools are still underutilized in the creative process. However, the participants showed interest in deepening their knowledge of the tools and developing their skills to enhance their performance.

From the responses to the questions mentioned above, the students highlighted some difficulties within the event, among which are notable:

- The limited time available for completing the challenges;
- The students' low level of prior knowledge regarding the use of GenAI in design processes;
- A lack of experience in constructing prompts;
- Limited familiarity with generative AI interfaces.

These challenges primarily occur, according to the students, due to a lack of digital literacy for the use of generative tools and a lack of experience in formulating effective prompts, resulting in low-performance use of the available technologies. The students also showed a clear preference for traditional design methods to achieve the desired results possibly because they are familiar with these tools in their ideation and creation processes. As observed in similar studies, the tools can provide AI-supported co-design, but designers need to enrich their skills to effectively "collaborate with the AI partner" [16].

Meanwhile, when performing activities using GenAI tools, students showed less concern about time, as artificial intelligence guided them more swiftly to final solutions. The stages of the design process (immersion, ideation, prototyping, and development) were perceived by students as being set aside or 'swallowed' by GenAI. Despite the difficulties identified through participant observation, we noticed the students' interest in enhancing their GenAI skills to apply them in their creative processes. Investing in the training of students, both in terms of technical knowledge and in the crafting of good inputs through prompting, can promote a broader and more sophisticated use of these tools, aligning with contemporary trends that see AI as a copilot in the design process.

V. LIMITATIONS

It is important to emphasize that this study represents the beginning of an investigation with hackathons and students from creative fields, and has some limitations. First, its results are based on a small quantity of data and cannot be generalized. Additionally, the study was conducted within a single educational institution, which may not fully capture the diverse ways students from different backgrounds and contexts engage with

Generative AI tools. Finally, as this is a qualitative study, the insights provided are interpretative and may not comprehensively reflect all the nuances of the participants' experiences. It is also worth noting that the students involved in the activity are from the fifth semester of the Design program. However, it provides insights for advancing the discussion through a scientific and experimental approach. The data analysis was conducted by three researchers who monitored all stages of the study, from its conception to execution, and also gathered valuable information through participant observation during the experiment. Future research could address these limitations by expanding the sample size, incorporating other methods, and exploring diverse educational settings to enrich the understanding of GenAI's role in creative education.

VI. CONCLUSION AND FUTURE WORK

GenAI have made significant advancements recently and have captured the interest of the academic and scientific community due to their disruptive potential, which reinforces the relevance of research on the subject. In this study, we investigated how students in the creative field use AI tools in graphic challenges. Based on our sample, the students are still not familiar with the techniques and GenAI tools in their daily workflows. This provides an opportunity to the development of training programs that enable them to effectively appropriate these technologies to optimize their creative processes.

It was observed that, although there was an initial advance in the ideation and drafting phases, the students faced considerable challenges due to a lack of prior knowledge and experience both with the technology itself and with formulating effective prompts for image generation. This often resulted in unsatisfactory outcomes, as highlighted by the students' comments about the discrepancy between their expectations and the images produced. Therefore, the implementation of GenAI tools in educational contexts requires a well-structured strategy that includes both technical and creative preparation, ensuring that participants can effectively use these tools.

This first stage of our investigation into creative challenges points to future theoretical-methodological advancements, suggesting an expansion of the sample size to increase the robustness of the findings and enabling the replication of the study across different creative domains for comparative purposes. Additionally, it is recommended that future educational initiatives include training programs focused on prompt strategies as well as on the creative and strategic use of these tools, aiming to reduce the gap between expectation and outcome and to explore more comprehensively the conditions under which Gen AI can be better utilized in creative educational environments, considering different contexts and skill levels.

We conclude that, despite the great potential of Gen AI as an auxiliary tool in the creative process, its effective implementation in educational contexts requires a systematic and integrated approach that addresses both the

technical and pedagogical development of students. In this way, it will be possible to promote a more robust and innovative use of these technologies, aligned with the needs and expectations of future professionals in the creative field.

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