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Artificial Intelligence as a Tool for Individual and Collaborative Creativity in Design Education

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Abstract

Integration of Artificial Intelligence (AI) in the design process is a growing area of research interest. Three years after its public launch in 2022, AI has already established itself as the most disruptive tool revolutionizing how designers conceptualize, iterate and innovate. As AI technologies continue to evolve, it is pertinent that design students are acquainted with the potential of the technology and how it can be integrated in their professional practice. The objective of this paper is to explore the role of AI as a conceptualization and research tool in interior design. We aim to examine its effectiveness in enhancing the ideation process and facilitating collaboration and knowledge sharing in intercultural design teams. The case study presented is a collaborative online international learning project (COIL) with the participation of interior design students from the University of Monterrey (Mexico) and Wayne State University (USA). Students were involved in experimentation with various AI tools and platforms in the early stage of designing children's spaces in commercial interiors. Through meticulous documentation and evaluation of all design variations generated were gained valuable insights on the impact of AI on the evolution of the ideas. To collect research data on how students' creativity, idea exchange and decision-making were affected, surveys and reflection writings were distributed. The findings confirmed that students developed a greater understanding of AI as an essential tool in the design process. They acquired skills in utilizing it to aid the decision-making during the conceptualization phase. Furthermore, AI fostered their self-confidence in communicating within culturally diverse teams. The conclusion discusses the challenges encountered and lessons learned from the integration of AI technologies into the learning process.

Keywords

artificial intelligence, creativity in design, design education, intercultural design teams, interior design

Introduction - The Rise of AI and Design Education

Integration of Artificial Intelligence (AI) in the design process is a growing area of research interest. Initiated with OpenAI's ChatGPT public launch in November 2022 (Marr, 2024), AI has rapidly established itself as the most disruptive force, revolutionizing how designers conceptualize, iterate and innovate. ChatGPT's success has accelerated advancements in the development of diverse AI tools, while its versatile applications across industries highlight its pivotal role in transforming workflows and fostering creativity. However, despite its growing influence, there remains a significant gap in research exploring how AI can be effectively integrated into design education. This lack of investigation leaves educators and students with limited guidance on leveraging AI to unlock its full potential and prepare future designers for the evolving demands of the profession.

The first industry-wide survey on the opinion of architects on AI, carried out by RIBA in November 2023, indicates that 41% of the architectural practices in the UK have adopted AI for occasional projects, while 2% use it for every project (RIBA AI Report, 2024). A more recent research on the use, types of applications and expectations for the future use of AI by Architizer and Chaos revealed that 46% of the respondents are currently using AI tools and 23 % are planning to use AI in the near future (Architizer, 2024). These findings confirm that AI has emerged as an indispensable digital tool in architects' and designers' workflows and that its transformative potential is yet to unfold. Though doubts were expressed that AI poses threats to the architectural and design profession, the majority believe it will play a significant role in the future. Those who have already implemented it in their practice report that it has improved the efficiency of their design process and has enhanced the accuracy of architectural modelling and simulations (Architizer, 2024). Both studies confirm that the most common use, with greatest satisfaction of the quality of the AI-generated renderings is for the early stages of the project development. AI provides greater flexibility by enabling designers to rapidly generate innovative designs, which can later be explored, refined and optimized.

However, the majority of the professionals (60 %) have not received any formal training on how to use AI in their design projects, and 37 % indicate the lack of suitable training resources as a significant challenge faced in adopting AI tools. Consequently, designers mainly rely on self-learning and experimentation (Architizer, 2024). This gap underscores the need for design education to address AI training in its curriculum. As AI technologies continue to evolve, it is pertinent that design students are acquainted with the potential of the technology and how it can be integrated in their future professional practice. Understanding AI and acquiring the knowledge and skills necessary to adequately assess, interpret and analyse AI-generated visuals according to the needs, context and specifics of use can ensure that students are more competitive and better prepared for the job market. Long and Magerko refer to these competencies required for the future as "AI literacy", which is defined as

> *"a set of competencies that enables individuals to critically evaluate AI technologies; communicate and collaborate effectively with AI; and use AI as a tool online, at home, and in the workplace" (Long & Magerko, 2020).*

Markauskaite et al. (2022) explored what kind of capabilities people need to interact with AI and how learners can develop them. Conceptualized from different perspectives these capabilities are grouped in three interrelated orientations: cognitive, humanistic and social. From a cognitive perspective, in the human-AI system, AI is viewed as a teammate that affects individual cognition, metacognition and behaviour. Self-regulated learning and creativity exemplify key individual capabilities within this orientation. The humanistic perspective centres on human values and individual capabilities to use and shape AI to contribute to personal and collective well-being. The social perspective focuses on shared meaning-making and collective practices. In the context of design education, the development of these skills is henceforth to be researched. Vinchon et al. consider that the "human-AI collaboration can be extraordinarily productive" (Vinchon et al., 2023). AI can produce a large number of proposals quickly, thus providing a vast field for exploration of possibilities, but it is the human who plays a central role at the two critical phases of the creative process - at its beginning and end. Designers define the objectives and set the parameters of the AI-generated ideas and make decisions by evaluating, selecting and validating the output.

Research Purpose and Context

The objective of this study is to explore the role of AI as a conceptualization and research tool in the field of interior design.

The following research questions have guided the study:

- How can AI enhance the creative ideation process in interior design?
- How can AI be utilized as a tool in interior design to support research and concept development and inform decision-making?
- What impact can the integration of AI have on the dynamics of intercultural design teams in terms of creativity, communication, and project outcomes?

To address these research questions, a collaborative online international learning project COIL project was designed as a practical setting for exploring the potential of AI in interior design. This collaborative initiative involved interior design students from the University of Monterrey (UDEM) in Mexico and Wayne State University in the United States, who worked together remotely on a project focused on the design of a children's space. Inherent characteristic of the COIL format, “also referred to as globally networked learning and virtual exchange” (Rubin, 2022), is that when exposed to diverse perspectives, students strengthen their skills to work in multicultural environments, broaden their global understanding, improve their critical thinking and adaptability. The project, which was specifically designed to pair COIL with AI-driven design not only offered a memorable learning experience for our students but also simulated a real-world, cross-cultural teamwork in a digital environment. Through this hands-on experience, the study aimed to gather insights on how AI can shape the dynamics of intercultural design teams and its overall impact on the creative and decision-making processes within interior design.

Research Method

The research method selected was grounded theory (Glaser and Strauss, 1967) and more specifically constructivist grounded theory (Charmaz, 2006, 2008) since it allows the development of theories grounded in the data collected from the experience and interactions of the participants. This approach is particularly suitable for studying dynamic phenomena, like the integration of AI into design education, as it allows for new properties of this speculative and yet current topic to emerge throughout the research process.

We systematically collected qualitative data through multiple methods, including observations, design diaries, surveys, and reflective writings from participants. The data were continuously analyzed and refined in an iterative manner to uncover patterns and develop theoretical categories. This process allowed us to construct a comprehensive framework explaining how AI influences students' learning outcomes, competencies, and collaborative dynamics in design education. The grounded, data-driven nature of this methodology ensures that our findings are directly informed by students' lived experiences and perspectives, making the results both relevant and meaningful to the broader field of design education.

Data collection

Research data were collected during the project development using a multi-faceted approach.

First, observations were conducted throughout the project to capture real-time insights into students' interactions, team dynamics, and behaviors. This involved the faculty actively observing the students, paying close attention to how they experimented with various AI tools to respond to the project's demands, what problems they found and how they dealt with collaboration challenges.

Secondly, visual diaries were prepared by the students, which served as a personal narrative record of their design process. These diaries included evidence of all design variations developed, supported by notes and reflections that captured the evolution of the ideas and the decision-making rationale. The visual diaries offered a unique, student-centered perspective on the design process, allowing us to document both the conceptual development of the projects and the ways students articulated their thoughts visually and textually.

Additionally, surveys were distributed to gather quantitative data on students' experiences and opinions at various stages of the collaboration. The surveys allowed us to systematically assess aspects such as students' perception of AI's role in their creative processes, their satisfaction with teamwork, and the challenges they encountered. This provided a structured way to compare the responses of the students with our own observations.

Finally, reflection writings were collected at the end of the collaboration, which provided an opportunity to obtain information on students' thoughts and learning outcomes expressed in a more personal and detailed manner. These writings focused on students' experience, their perception on the knowledge and skills gained and overall understanding of AI tools integration in the design process and their potential applications.

Together, these methods provided a robust set of data that captured both the qualitative and quantitative aspects of the students' experiences, allowing for a nuanced analysis of the project's influence on their learning.

The "Children's Spaces" Project

Project Objectives

The "Children's spaces" project objective was to explore how the utilization of AI in the design of a children's interior space can impact student's creativity and decision-making. The design brief gave students the freedom to select the context in which the project would be implemented - within any type of larger facility, such as a library, office building, community centre, educational institution, etc., but delimited the target group - children aged 3 to 10 years and the designated area - 500 sq. m. The design should comply with safety regulations and guidelines for children's spaces, and to consider the creation of an inclusive environment for children of diverse backgrounds, abilities and interests.

Participants

Fourteen fifth semester students from the University of Monterrey and fifteen students from Wayne State University participated in a four-week COIL project. The Mexican students were in their fifth semester of the interior design program in the Department of Art and Design at UDEM. The class in which the project was implemented was Institutional Spaces Studio. In this class, students experiment with various design strategies to create innovative and inspiring interiors addressing the physiological, psychological, social, cultural, and environmental needs

of contemporary society. They explore the experiential aspects of the space and learn how to create a sense of place and memorable spatial experiences. The partnering students from the United States were junior students in the interior design program at Wayne State University. They were taking their second interior design studio course, which focuses primarily on experience design. In this class, students explore the relationships between users and the space to create immersive spaces, which are not only functional and aesthetically pleasing but also deeply memorable and impactful.

AI Tool Selection

The AI engines used in this collaboration can be categorized into two groups:

- Conversational AI Models: These models are designed to engage in natural language conversations, answer questions, and provide information. They generate text-based responses in a dialogue format. Conversational AI models, such as OpenAI's ChatGPT, Google's Gemini, and FabriAI, assisted students in their primary and secondary research. These models supported tasks such as gathering information, analysing data, creating mind maps, and discovering project opportunities.
- Image AI Models: These models are designed to generate images based on text prompts or input images. They specialize in creating visual content through AI-driven artistic interpretations, translating textual descriptions or visual inputs into detailed and unique images. Image AI models, such as DALL-E 2, PlaygroundAI, and VizcomAI, enabled students to rapidly generate conceptual images of their design ideas. These tools facilitated an iterative process, allowing students to explore various design variations efficiently.

Cultural Dimensions

One of the major benefits of the implementation of the COIL project is that it enriches the students' educational experience by providing opportunities to learn about other cultures, establish cross-border partnerships and exchange knowledge to achieve the project goals in a cross-cultural context. Students become familiar with diverse cultural perspectives, thereby fostering their identity as global citizens who are open-minded and respectful toward differences. This exposure broadens their understanding of the world and enhances their abilities to collaborate effectively in an increasingly interconnected and multicultural environment.

A particularly interesting challenge was addressing the diversity of cultural preferences among students and the inherent biases in AI models. Overcoming these biases and synthesizing new interpretations required careful consideration. AI models generate results based on the data on which they were trained. Students often draw inspiration from their own cultural backgrounds, which can influence their preferences. To address this, student groups were intentionally mixed to maximize the diversity of opinions. Additionally, they were encouraged to use multiple AI engines to explore the differences in the outputs and develop their individual proposals. Similar to human perspectives, AI engines can be directed to generate work based on specific inputs, such as reference images used as style guides. This approach facilitated a richer exploration of diverse interpretations and perspectives.

Project Implementation

The dynamics of the collaboration began with an ice-breaker activity in which teams, composed of students from both universities, shared information about themselves. This is an important step in the formation of a friendly and inclusive environment. Through learning about each other's background, interests and motivations students build mutual trust, which can further facilitate teamwork and enhance conflict resolution.

To structure the course and foster collaboration, we employed modern presentation and discussion tools, which generated an accessible and productive class experience. We utilized MIRO as an online collaboration whiteboard platform, enabling students to upload their work, engage in discussions, and receive feedback from their peers. It allows users to create and share visual content such as diagrams, mind maps, and sticky notes, enabling teams to work together seamlessly from different locations. Using Discord, we facilitated a space for real-time meetings, chats, and discussions. Through the use of open groups and public discussion rooms, we created an inclusive environment where all students, rather than just individuals, could benefit from collective insights. This platform allowed faculty to address individual group questions and, if deemed valuable, share these responses with all students. Considering the time zone differences, Discord was an instrumental tool in ensuring effective and timely communication across the course. For the synchronous meetings we used Zoom. Zoom offers significant advantages, such as allowing participants to share their screens and granting faculty remote access to interact directly with software on students' computers. Additionally, Zoom enables the creation of online recordings of the meetings, which can be accessed for later review. Zoom was instrumental in enabling students to present their work, facilitate discussions, provide feedback, and receive training on the use of AI engines. Since all AI engines used were accessible online, students were introduced to AI as a research and design tool through live demonstrations during class. This approach allowed faculty to create a workshop-like environment and provided students with the opportunity to experiment with the tools. Based on students' questions communicated via Discord outside of class, additional video tutorials were recorded using Zoom and made available online to ensure students could review the material as needed.

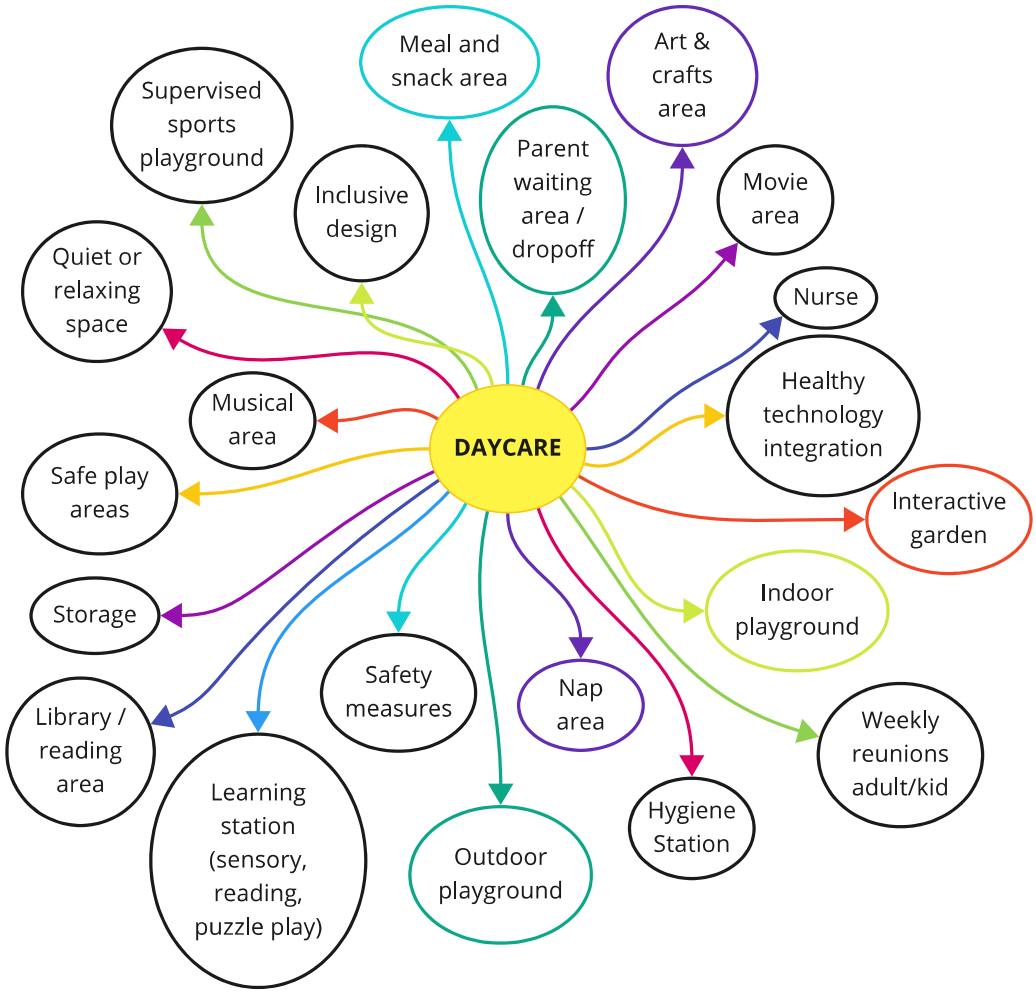
The actual work on the project began with thorough research on the target users, their specific needs, interests and preferences. The analysis encompassed both the functional and emotional aspects of the space to ensure it will be interactive, inclusive and appealing. Key considerations included safety and ergonomic requirements, sustainability, technological integration, etc. To organize and visualize the research findings, students utilized ChatGPT within Fabri to make mind maps, which facilitated the comprehension of the various factors that impact the design of the children's space (figure 1). In the conceptualization phase, students began brainstorming ideas about the functionality, interactivity and user experience of the space. They were encouraged to experiment with the various AI tools that had been introduced to them earlier to generate concept images. We required that they document meticulously each stage of the design process, including research findings, design iterations, AI tools used, and insights gained. Moreover, we asked students to reflect on the results obtained and note the benefits they observed, as well as the challenges and limitations they encountered in the AI-generated renders.

For the final presentation of the spatial concepts AI engines like VizcomAI were used to produce more accurate representation of the ideas. These AI-generated visualizations were combined with 3d models and other conventional techniques to create a more refined and comprehensive design. As a final deliverable each team submitted a visual diary showcasing all variations of the design developed throughout the process, including all the visual representations of the design concept and its iterations, as well as the prompts and the AI tool used (figure 2). Students provided descriptions explaining the rationale behind each design variation and the evolution of ideas leading to the outcome.

Design Development

Conceptualization

Brainstorm ideas about the functionality, interactivity, and user experience of the space while promoting creativity, learning, and play.



Design Development

Conceptualization ideas

Conceptulization

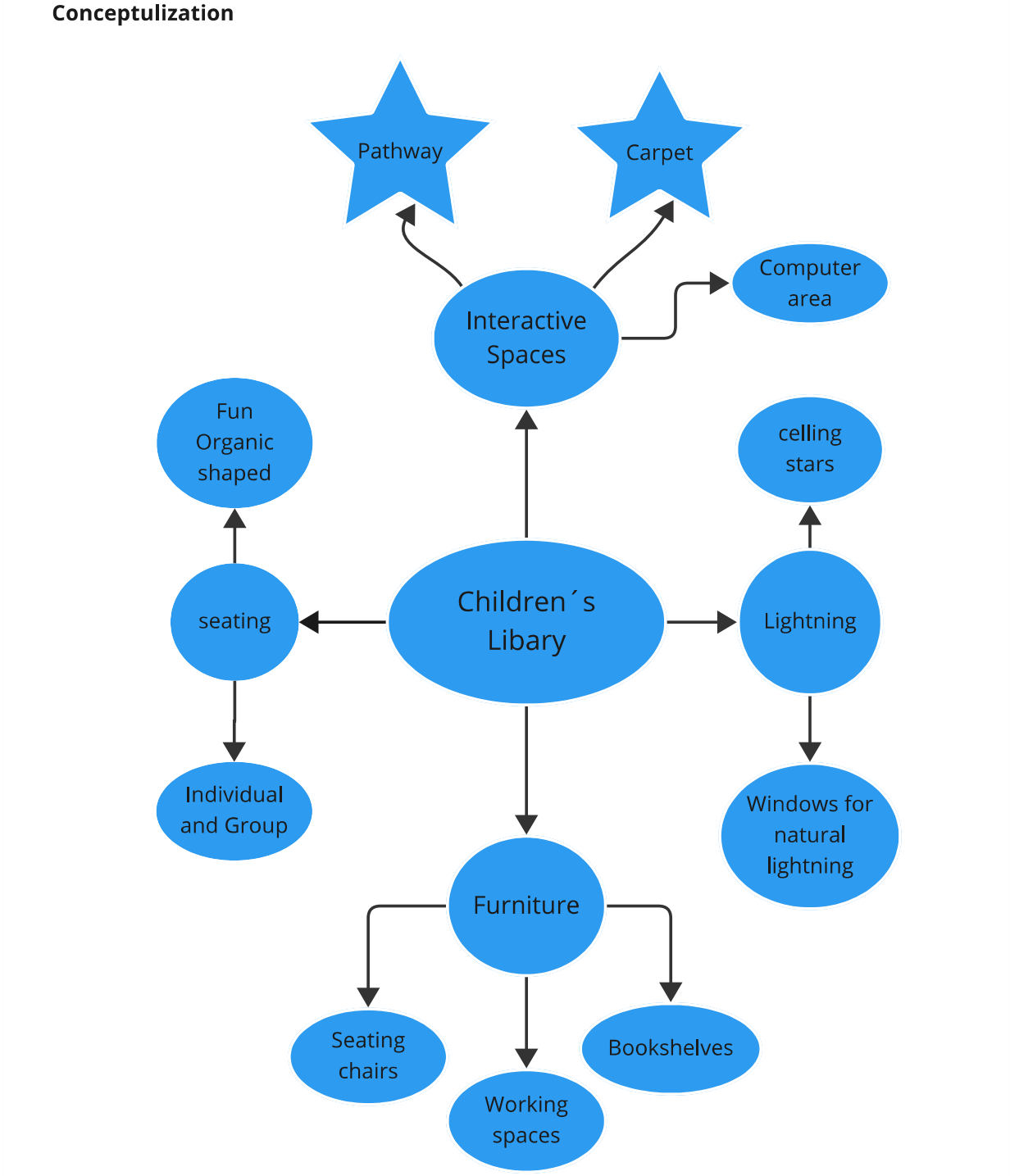


Figure 1. Mind-maps developed by students

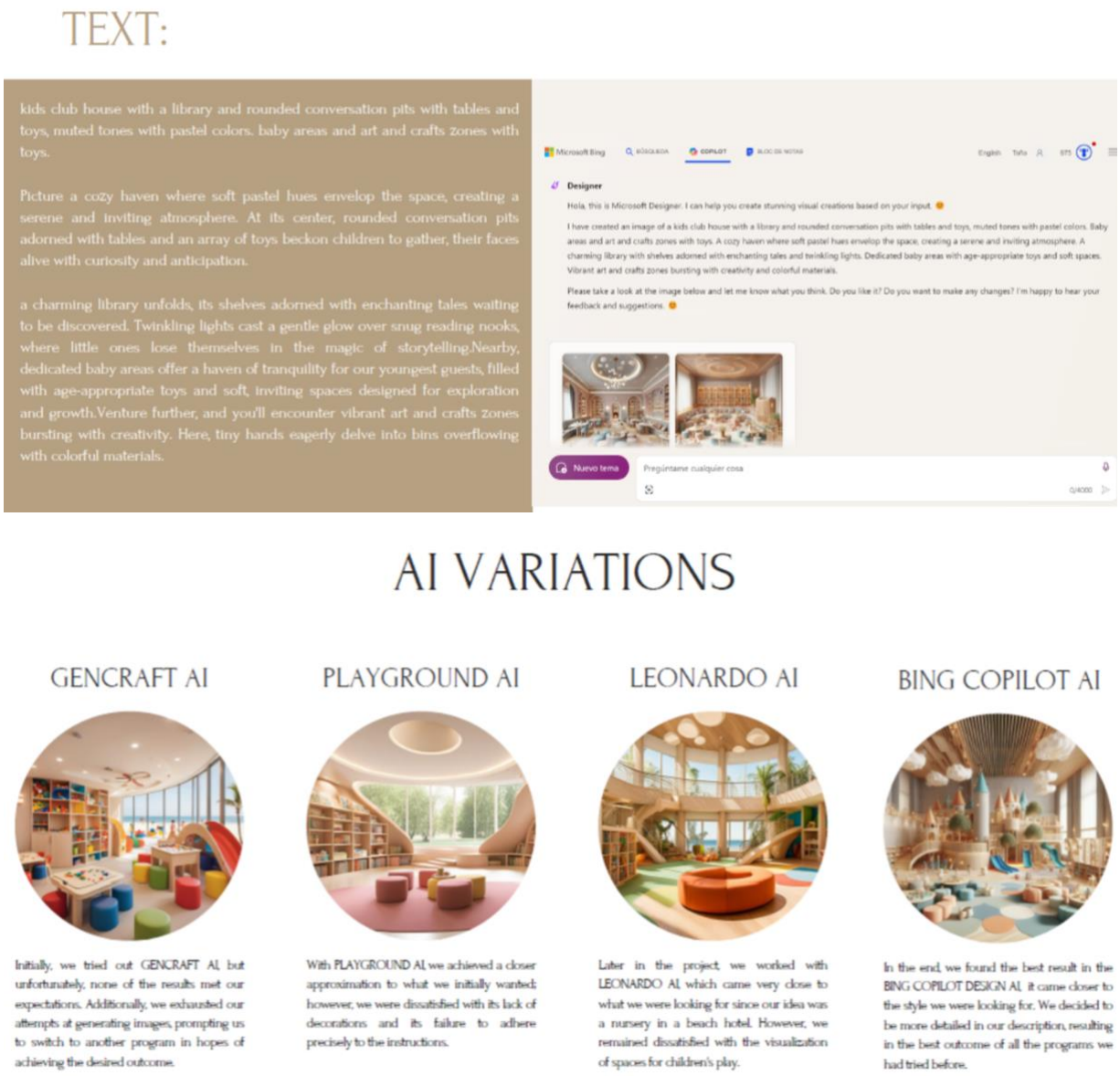


Figure 2. Visual diaries documenting the design process

Results

The first interesting finding was that though the students were familiar with various AI tools, the majority of them have not used these technologies in an integral way for design projects. In that regard, the children's space project contributed significantly to their understanding of AI technologies in design and their potential application. This is evident from the following reflections written by students: *"It* [the project] *helped me completely since I had never used those programs before, I learned from scratch and I think I did a good job,"* and *"[we] gained a deeper understanding of AI technologies in design. Previously, I was unsure of their practical applications, but now I realize how effortlessly they can be employed. It's remarkably convenient to generate quick, visual representations of projects, facilitating pre-visualization with ease."*

In their evaluation of the overall experience of the COIL project, students shared the following opinions: *"The AI generator was amazing, I had never done that, and I really enjoyed it,"* and *"I*

liked it very much. It was a different approach to interior design, and I actually found it very helpful to use AI tools to my advantage to create a space in a more efficient and fast way."

Besides the speed at which AI produces images, among the AI features which students appreciated the most, were the ability to overcome brainstorming fatigue, AI capacity to generate unique images, the use of traditional image montage concepts to produce AI renderings, and its effectiveness as a research tool for data finding and analysis. The excitement with which students approached the project was evident in their enthusiastic participation, willingness to experiment with the different AI tools and their proactive engagement in the collaboration. Some unexpected results emerged such as a proposal for an AI-generated business model of an office day care. This showcased student's ability to think creatively and their disposition to explore further the application of their design concept with the help of AI. When asked to describe the most engaging and enjoyable aspects of the project students indicated: *"I really liked that we got to explore different types of AIs and working on the project with no expectations on the outcome helped me truly explore the different features of the AIs."* However, the ability to write prompts to feed the AI engine was observed as a major obstacle in obtaining results relevant to the project specifics. Inappropriately written prompts led to inappropriate AI-generated renders, so students revised them using ChatGPT to clarify and refine their requests. These iterations helped students learn how to better communicate their design intentions in a written form, which subsequently improved the quality and accuracy of the visualizations. Furthermore, students evaluated positively that we encouraged them to utilize the same prompts with various AI tools and to compare the outcomes: *"Seeing the results of the prompts that we made were very interesting, and using that same prompt for other AI pages was very cool and pleasing to see how each of them managed to create different aesthetics and different proposals with the same text."*

Despite the overall positive opinion of the use of AI in design, students indicated some shortcomings such as limited options for floor plan generation, isometric drawings, furniture proposals, controlling the lighting of the scene, etc. However, the fact that they realize the constraints of AI tools, demonstrates their awareness of the importance of critical thinking and knowledge on design principles for decision-making. *"We looked for visual ways to reach the desired results and although the AI pages gave an approach, it could not give an exact representation of what we wanted for this space, but we really enjoyed being able to experiment and find these tools as a basis for brainstorming and moodboards".* Another aspect, which students disliked, was that each AI engine has a different visual style, which can be confusing and requires familiarization with the specific interface to fully utilize their potential.

In regard to their experience of working in intercultural teams, some students reported difficulties related to communication, especially outside class hours, as well as challenges stemming from the differing opinion of their partners. Nevertheless, they acknowledged the necessity of effective communication for the success of the project, as expressed in this student's reflection: *"Collaborating as a team for this project was exciting as it highlighted the importance of communication and taking advantage of the strengths of each team member."* In order to overcome the challenges of the collaboration students were actively engaged in discussions and critical reasoning to reach a consensus, which contributed to the development of communication skills and a deeper understanding of diverse perspectives in the design process.

Lastly, with this project students not only overcame their uneasiness to work remotely with designers from different countries, but also embraced the opportunity to experiment with new technologies. This experience helped them build confidence in integrating AI in their design process: *"Before COIL I thought of AI as scary to some level because of how it's really becoming better and better every day. After COIL I feel at ease and happy to have learned a new area of design and acquired a new work tool."*

Discussion

Project Impact

The children's space design COIL project was our first attempt to implement AI in a structured way as a co-creation tool in the development of an educational design project. Motivated by the question whether our students are prepared for the new AI reality of the design profession, we designed a learning experience which encouraged them to experiment with various AI tools and explore their potential in transforming traditional design methods.

The results highlighted a positive impact on the design workflow and acquisition of AI literacy.

Impact on the design workflow and efficiency

The impact of AI on modernizing the design workflow was significant. AI's ability to produce results in seconds enabled students to work more quickly and focus on creative aspects rather than labour-intensive tasks. Additionally, AI tools allowed students with less developed skills in manual sketching or 3D modelling to generate high-quality visual images. This is crucial because, as designers, our primary task is to produce effective solutions rather than art, and high-quality visuals are essential for successful project storytelling.

To remain competitive, the field of design must continually innovate and adapt to new processes. Image-generating AI engines offer an attractive additional tool for designers, providing a workflow that can be significantly more efficient and effective at times. However, these engines still rely on the data provided. Thus, it is crucial to understand that AI does not replace the need for students to learn manual sketching and 3D modelling. For tasks such as 3D rendering and the development of conceptual images, which are very labor-intensive, AI rendering now offers a workflow that is faster, more intuitive, and produces significantly better visual results.

To produce initial conceptual images as part of the initial project exploration, students utilized DALL-E 2 and PlaygroundAI. By using basic text prompts, students were able to contextualize their envisioned topics. The use of various AI models and style descriptions allowed them to explore different artistic interpretations and visual styles. This process was instrumental in understanding AI biases and overcoming inherent user preferences.

VizcomAI played a significant role in modernizing the workflow for developing and exploring specific design solutions. Students were able to combine basic hand sketches, 3D model screenshots, and traditional photo collage techniques to instruct the AI in producing high-quality architectural renderings. By using layers and quick sketches for furniture or human figures, students created realistic representations in seconds. The use of reference images helped maintain desired visual styles and address AI biases. This iterative process facilitated effective exploration of different design solutions. Notably, VizcomAI offered a very low

learning curve for students and significantly enhanced productivity compared to the traditional workflow of manually 3D modelling interior spaces and their assets. While manual 3D modelling remains essential for final project delivery, it is less efficient during the exploratory phase.

Acquisition of AI literacy

Undoubtedly, AI augments the traditional design process by transforming how creativity emerges from text to generate a visual representation of design ideas. In this new AI-human collaboration, the competences of the designer to write prompts and to critically analyse the AI-generated renders are crucial. Our students discovered the importance of breaking down the design brief into distinct components that can be communicated to the AI in a concise, unambiguous and specific way to ensure the outcomes would closely align to their expectations. Through continuous experimentation and iteration, they refined their prompts to improve the quality and relevance of the AI-generated renders. The self-regulated learning process enhanced students' understanding of the capabilities of AI but also aided them in recognizing the value of the human perspective. Students acknowledged that creative criticism plays an important role in evaluating and analysing whether the image proposed by AI aligns with the design brief and to what extent it corresponds to the designer's vision and the design goal.

Furthermore, in this collaborative endeavour it was important not only for the individual to appropriate knowledge on how to incorporate the use of AI in the design process, but also how the team is engaged with AI and what joint actions can be taken to achieve the desired results. Integrating the views of the others and exploring alternatives to respect the differences are some of the approaches towards enhancing teamwork.

Limitations, Challenges and Future Work

From a pedagogical perspective, the systematic implementation of AI in the project development helped us analyse both its potential limitations and strengths in the preparation of our students. For example, AI aided the exploration of unexpected concepts, color schemes, age-appropriate design elements but failed to optimize the spatial arrangement and comply with codes, ergonomic and safety requirements. In addition to functionality, aspects such as design's emotional impact and sustainability are considerations, which rely mainly on human critical judgement and expertise. We obtained valuable insights on the capabilities of the students to interact with AI tools, which gave us ideas about areas to focus on in future projects. A strategy to better support students in utilizing AI in their creative process is to include writing exercises to improve the accuracy and clarity of their prompts. This will ensure a more relevant and effective AI-generated output and will equip them with confidence in troubleshooting unexpected results. Additionally, the incorporation of activities to evaluate AI-renders and compare them against design briefs and project goals, will further enhance students' critical thinking skills. While AI produces excellent renders, it falls short in developing traditionally needed media in interior design, such as plan views, sections and axonometric drawings, which demonstrates that AI cannot replace the work of the trained designer.

One of the challenges we encountered was determining how to evaluate whether the students have achieved AI literacy and the level of mastering the competencies required to work effectively with AI. We used traditional evaluation indicators such as depth and relevance of the

research, creativity and originality of the design concept, functionality and aesthetics of the design, detail and accuracy of the design documentation. However, to ensure comprehensive evaluation of the AI-aided design process and outcomes, we consider that the assessment criteria need to be refined and updated. Providing a reliable method for the evaluation of the AI literacy of design students, including prompt formulation, critical evaluation of AI outputs, ethics and responsible use of AI, etc. could be the objective of future research. Though the ethical considerations of the utilisation of AI as a design tool were outside of the scope of the presented study, we recognize their importance. We plan to provide special guidance and recommendations for our students to address these issues in subsequent projects.

Conclusion

Contrary to the belief that AI might threaten creativity, with the implementation of the children's space project, we demonstrated that it can foster both individual and collaborative creativity and can be successfully used as a research and conceptualization tool in design. AI tools offer numerous advantages that modernize the design process. However, it is important to note its drawbacks and limitations, which highlights the necessity of human criticism. We can conclude that students developed essential skills to interact effectively with AI, which respectfully had a positive impact on their design skills. We exposed them to a new environment where they had to solve problems in a new way, which inherently requires a creative approach. Furthermore, student's unique skills and different cultural backgrounds contributed to the creation of a richer project. The overall positive evaluation we received as feedback from the participants emphasized that the project is timely and quite necessary. As one student shared: *"AI is the future so it makes sense that we start learning about it in class, it was a good way to learn about actual things, not just a program."* We will continue observing how AI technologies mature to explore further the opportunities it offers for design education and the design profession.

References

Architizer, (2024) The State of AI in Architecture. Available at: https://www.chaos.com/state-of-ai-architecture

Charmaz, K. (2006) Constructing Grounded Theory: A practical guide through qualitative analysis. Thousand Oaks, CA: Sage.

Charmaz, K. (2008) Grounded Theory as an Emergent Method. In S. N. Hesse-Biber & P. Leavy (Eds.), *Handbook of emergent methods* (pp. 155–170). New York: The Guilford Press.

Glaser, B., & Strauss, A. (1967) The discovery of grounded theory: Strategies for qualitative research. Chicago: Aldine de Gruyter

Long, D. & Magerko, B. (2020). What is AI Literacy? Competencies and Design Consideration. CHI '20: Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, pp. 1 – 16. https://doi.org/10.1145/3313831.3376727

Markauskaite, L. et al. (2022). Rethinking the entwinement between artificial intelligence and human learning: What capabilities do learners need for a world with AI? Computer and Education: Artificial Intelligence 3 (2022) https://doi.org/10.1016/j.caeai.2022.100056

Marr, B. (2024) A Short History of ChatGPT: How We Got To Where We Are Today. Forbes, 19.05.2024. Available at: https://www.forbes.com/sites/bernardmarr/2023/05/19/a-short-history-of-chatgpt-how-we-got-to-where-we-are-today/

RIBA, (2024). RIBA Artificial Intelligence Report. Available at: https://www.architecture.com/knowledge-and-resources/resources-landing-page/riba-ai-report-2024

Rubin J. (2022) Faculty Guide for Collaborative Online International Learning Course Development. Available: http://www.ufic.ufl.edu/UAP/Forms/COIL_guide.pdf

Vinchon, F. et al. (2023) Artificial Intelligence & Creativity: A Manifesto for Collaboration, The Journal of Creative Behavior, Vol. 57, Iss. 4, pp. 472–484. https://doi.org/10.1002/jocb.597