

# Integration of architecture and communication: a transversal learning methodology empowered by artificial intelligence tools

## Integración de arquitectura y comunicación: una metodología de aprendizaje transversal potenciada por herramientas de inteligencia artificial

Grajeda-Rosado, Ruth María<sup>a</sup>, Rosello-Luna, Alma Saraí<sup>b</sup>, Vázquez-Torres, Claudia Eréndira<sup>c</sup> and Sotelo-Salas, Cristina<sup>d</sup>

<sup>a</sup> ROR Universidad Veracruzana • HTR-6109-2023 • 0000-0001-9961-3541 • 802541

<sup>b</sup> ROR Universidad Veracruzana • KEH-2869-2024 • 0009-0009-0272-5439 • 1245143

<sup>c</sup> ROR Universidad Autónoma de Yucatán • HTM-1544-2023 • 0000-0002-5388-0780 • 181807

<sup>d</sup> ROR Universidad Autónoma de Baja California • KDN-0964-2024 • 0000-0001-8685-4290 • 358418

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\* ✉ [lgrajeda@uv.mx](mailto:lgrajeda@uv.mx)

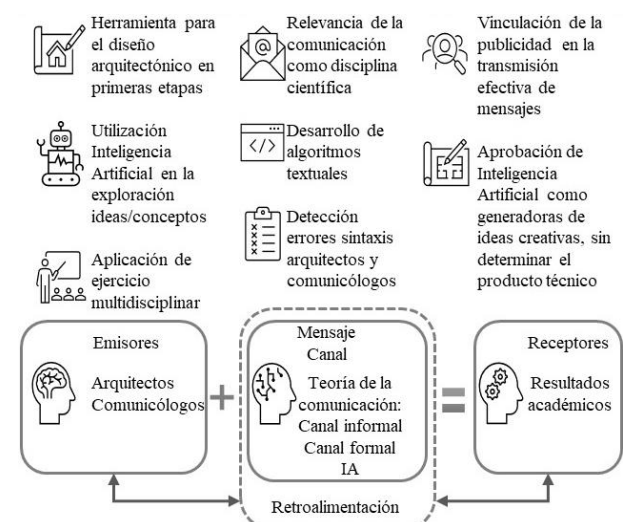
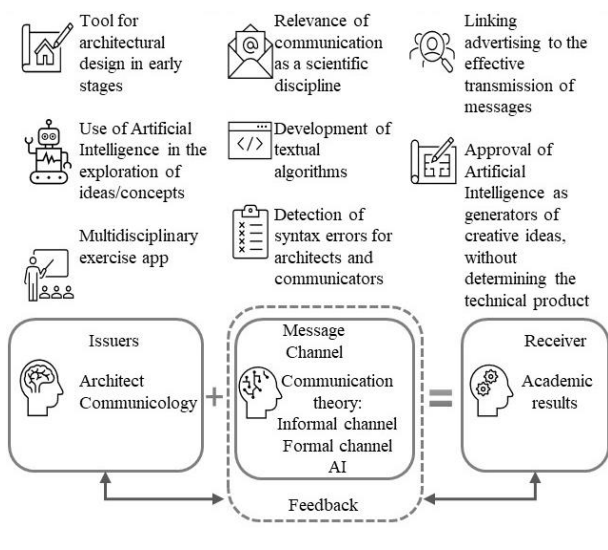


### Abstract

With the growing implementation of Artificial Intelligence (AI) in the architectural field, significant challenges arise in education with ethical and social connotations. In the context of Architecture and Communication degrees, AI emerges as an essential tool, especially in the initial stages of architectural design in exploring ideas and conceptualizing projects. This article addresses the complexity inherent in using AI in architecture, highlighting its fundamental contribution to improving visual representation through textual algorithms, and analyzes the relevance of communication as a scientific discipline. In this context, communication in architecture is directed towards advertising and the effective transmission of messages. The article presents a methodology focused on detecting didactic errors among architecture and communication students, thanks to multidisciplinary collaboration. In conclusion, it is highlighted that the appropriate use of AI can boost the generation of creative ideas, allowing students to direct them and complement them in technical aspects. This study highlights the importance of effectively integrating AI into academic training, highlighting its benefits in improving creativity and precision in architectural communication.

### Resumen

Frente a la creciente implementación de la Inteligencia Artificial (IA) en el ámbito arquitectónico, surgen desafíos significativos en la educación con connotaciones éticas y sociales. En el contexto de las licenciaturas en Arquitectura y Comunicación, el uso de IA emerge como una herramienta esencial, especialmente en las etapas iniciales del diseño arquitectónico en la exploración de ideas y la conceptualización de proyectos. Este artículo aborda la complejidad inherente al uso de IA en arquitectura, destacando su contribución fundamental a la mejora de la representación visual mediante algoritmos textuales y analiza la relevancia de la comunicación como disciplina científica. En este contexto, la comunicación en arquitectura se dirige hacia la publicidad y la transmisión efectiva de mensajes. El artículo introduce una metodología centrada en la detección de errores didácticos entre estudiantes de arquitectura y comunicación, gracias a la colaboración multidisciplinaria. En conclusión, se subraya que el uso apropiado de IA tiene el potencial de impulsar la generación de ideas creativas, permitiendo a los alumnos dirigir las ideas y complementarlas en aspectos técnicos. Este estudio destaca la importancia de integrar de manera efectiva IA en la formación académica, resaltando sus beneficios en la mejora de la creatividad y la precisión en la comunicación arquitectónica.



### Architecture, Didactic communication, Artificial intelligence

### Arquitectura, Comunicación didáctica, Inteligencia artificial

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## Introduction

The inception of a requirement marks the beginning of any communication or architectural project, signifying the opportunity to create an innovative and highly functional solution. The realization of an architectural endeavour, spanning from its initial phase to remodelling processes, requires methodical steps that encompass the trinomial criteria: functional, aesthetic, and structural, with the current inclusion of the environmental aspect. In the preliminary stages, it is imperative to delineate the project's nature and initiate the analytical phase, involving considerations of physical context conditions, program determination, and cultural and social factors.

This is where the generation of ideas begins, and the concept takes form, rooted in technique and geometry. These ideas find expression in architecture through concepts grounded in the theory of integrating elements and design principles. The former includes point-line, direction, shape, size-scale, colour and texture (Pastor, Martin, & Pintado, 2018), while the latter comprises emphasis, balance, equilibrium, rhythm, movement, proportion, scale, unity, harmony, contrast and space (Ching, 2015). These elements collectively shape the graphic representation of the design and serve as the guiding concept of the project. The final stage involves the actualization of the idea through the preparation of technical documents that mirror the intellectual work of the initial two stages.

Throughout the entire process, linguistics, which concerns the relationship between meaning and signifier, plays an essential role as a guide for the development of proposals. Before the emergence of modernism, projects were governed by a set of rules, codes, and lexicon, wherein the built work ensured its permanence through dialogue. Subsequently, modernism opened the conversation to new languages, determined by the personal temporal context of the architect and his limits of openness to the outside world, eventually reaching the digital age (Muñoz-Cosme, 2018).

Carpo (2017) distinguishes between two digital eras. The first, known as the era of mass customization, characterized by the use of digital tools to create unique designs through parametric and algorithmic processes. This period encompasses the emergence of parametric design and digital manufacturing technologies, enabling architects to produce complex, non-standardized architectural forms. In contrast, the second digital age represents a shift toward a more standardized and automated approach to architectural design. This stage is highlighted by the increasing influence of artificial intelligence (AI) and machine learning in the architectural design process. Carpo argues that the second digital era is distinguished by the utilization of AI to generate architectural designs, leading to a transformation in the conception and development of architectural forms by architects (Al-Azzawi & Al-Majidi, 2021).

At this juncture, the use of digital tools alters the perception within the methodology of stages two and three. According to Champitaz (2020), engaging with the client constitutes the social aspect of the design, a linguistic discourse that must be imbued with empathy and assertive signifiers of the preceding stages. This type of communication cannot be achieved using artificial intelligence (AI) tools.

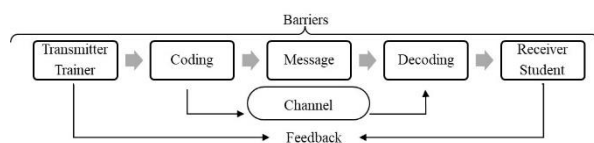
However, using artificial intelligence as a tool for architectural design addresses several critical problems and challenges in the disciplinary field. AI aids in generating architectural intentions and forms, supporting academic and theoretical models, fostering technological innovation, and improving the efficiency of the architectural design industry (Li, Wu, Xing, & Wang, 2023). It offers the potential to inspire and enhance architectural design but must be used ethically and responsibly to avoid negative impacts on human creativity and design ethics (Hegazy & Saleh, 2023). Furthermore, AI can assist in developing a virtual environment for conceptual design in architecture, providing a platform for architects to experiment and visualize design concepts (Cudzik & Radziszewski, 2018). As well as creating intelligent design agents by providing quantitative ways to measure customer needs and preferences and offering a mathematical framework for making design decisions (Sherif, Asadi, & Karan, 2018).

In the present study, the results of an academic exercise that integrates three types of channels in the dialogue are presented: User (informal communication)-Architect, Architect-(formal communication)-IA and User/collaborator-(formal communication)-Architect. This integration aims to gather student assessments and identify potential enhancements in the teaching model while responsibly and ethically promoting the use of AI tools in learning strategies, without compromising skills such as the ability to efficiently conceptualize space in three dimensions. The primary contribution lies in the integration of multidisciplinary teams in project development, optimizing execution times, and ensuring effective communication with users through the use of AI tools.

### The science of communication and architecture

To understand the interaction between communication sciences and architectural design, is essential to delve into its historical development. The emergence of communication sciences as a discipline date back to the early 20th century, driven by advances in technology and media studies. At the same time, architectural design evolved in response to social and cultural changes. The two disciplines intersected as architecture increasingly incorporated visual and spatial communication techniques to convey meaning and create liveable experiences.

#### Box 1



**Figure 1**

Outline of the communication process

Source: (Berlo, 1987)

In its basic form, Communication Theory investigates and studies the ability of certain living beings to establish relationships with others through the exchange of information. According to Otero (2019), the use of the word “communication” depends on the context, for example, a fact (gesture, conversation, use of technological resources, media programming), engineering (advertising, propaganda, campaigns) and the theory (models, hypotheses, intellectual products). Communication as a science is responsible for studying the communicative processes, the exchange of information between two or more participants or users in order to transmit data, it uses elements such as: sender, receiver, message, code, channel, and context (Fig. 1).

In changing information, ideas, and feelings, it is essential to have standard codes for the sender and the receiver. At this moment, semiotics, the study of the sign and its meaning, enters the scene. Architecture and communication, in their theoretical form, have been linked to concepts such as semiotics, semantics, denotation, and connotation. Semiotics in architecture analyze spatial configurations, shapes, materials, light and colours, and their meanings, evoking specific sensations and responses in users (Barthes, 1991; Venturi, Stierli, & Brownlee, 1977; Eco, 1979). Semantics, closely related to the previous concept, allows for consideration of the context in which these signs and symbols are interpreted to ensure that users effectively understand the intended meanings (Norberg-Schulz, 2019; Jencks C. , 1978), the synergy between architecture and communication seeks to create designs that resonate on a conscious and subconscious level with users.

Denotation is the primary function, object, or essential action, which in architectural language translates as a clear and direct communication of purpose and utility (Groat & Wang, 2013; Boonyanan, 2018). On the other hand, connotation refers to the subjective, associative, and cultural values that individuals attribute and add to said object or action (Jencks C. , 1997; Pallasmaa, 2012, pág. 33). These are some of the basic concepts of communication theory that interact with Architecture.

However, conceived as a science, communication includes methodologies to conduct user research, analyze their perception, and develop narratives that inform architectural decision-making using AI tools, such as corporate identity. The corporate identity consisted of associating the needs of the students in a community space for coexistence and food with the identity of the public university faculty. The communication students developed this concept. As a result, a document was delivered to the architecture students to carry out an exercise intended for a social space in the Faculty of Communication Sciences of the Universidad Veracruzana, Veracruz Region.

The document called Corporate Identity was detailed and offered information on the company involved, which is Veracruz University and the faculty cafeteria, presenting a specific project that determined the conceptual, functional stages, representation, communication, and analysis of results with AI tools. that facilitated communication and exchange of ideas at all stages and determined objectives; Within the creative area it allowed the development of the design concept, its communication, marketing, and advertising (Busch, Sander Jensen, & Barros, 2023). The importance of a brand report (Brief) consists of having reference elements: description, background, and context; operational elements: objectives, measurable strategies, and schedule; and determining elements: restrictions, budgets, deliverables, and times.

Another instrument is the brand management document (Branding), to create, both at the creative level with the diagnosis, the reference points, the individuals or groups of interest and impact, and the descriptive map of the customer experience towards the product (Benchmarking, Stakeholders, Customer journey map, respectively); until achieving positioning in the consumer's psyche (focused on marketing, Target). As Philip Kotler, father of marketing, defines it: "*Branding is a communication exercise to define what you are since each company wants to be in the minds of its consumers*" (Endor, 2023).

Finally, Corporate Identity presents the projection of the company, including its logo, colors, typography, vision, mission, values, and, in general, the image. This theory mentions that "*It is the image management process, the fundamental variables are: identity, communication, image, and feedback. The reality of the corporation of its unique and individual personality differentiates it from other companies*" (García, 2021).

### Computing in the architecture learning process

Computer science in the Architecture profession has created excellent digital tools for design and construction, and its effect on practice and education has been manifest for four decades (Andía, 2022); speaking only of design, there are currently countless software, such as AutoCAD, 3D StudioMax, Sketch-UP, V-Ray, Revit AutoDesk, and ArchiCAD, which are beginning to experiment with AI, for the moment, they are highly used in the professional field of architecture and construction as means of representation, communication, visualization and realization of deliverables for the construction of a project, regardless of what other software supports in the decision of technical, structural, installations, bioclimatic, costs and energy efficiency aspects.

It should be understood that the difference between a computer program and software is that a machine does not analyze; it simply performs the actions for which it has been programmed. Therefore, it responds logically to orders: If this happens, do it. On the other hand, artificial intelligence (AI) also receives orders; however, after the instructions, its objective is to collect data in big data and provide solutions (Teknei, 2023). Analyzing the origin of AI, Turing (2007) defines it as the ability to ensure that a machine has human-level performance in cognitive tasks without being detected by humans. For this, learning as an objective becomes fundamental (Machine Learning), dividing it into automatic and deep. The first is classified as Supervised, Unsupervised, and Reinforcement Learning and the second is based on using Artificial Neural Networks, that is, data interaction on an autonomous basis (Díaz-Ramirez, 2021).



Currently, these tools replace the manual skills of technical representation in the profession; however, the use of these In academic life may have another meaning if they seek a different purpose from mere visual representation (Rocker, 2010). Therefore, educational programs continue to encourage the student to complete their basic skills and abilities of manual graphic communication to express their ideas and obtain sufficient maturity to create their digital content and designs in the physical-cultural context of the project, that is, with meaning and without plagiarism.

Some research (Gómez, 2011; Bohórquez, Montañez, & Sánchez, 2020; Guzmán & Caderon, 2020; Vera, 2022), established the advantages of using digital tools in architecture education, which, in addition to being excellent means of representation in learning they support logical-methodological thinking, the analysis of design and research processes, and allow rapid feedback and interaction between teachers and students, the researchers conclude that it will enable improving the analysis-generation-evaluation of the development of a project, widely recommending the interaction and promotion of the combination between analog, digital models and physical models (models) at different scales. Başarır (2022) suggests that integrating AI into the architectural design curriculum is beneficial in increasing students' awareness of all areas of architectural design in the form of input, process, and output. Likewise, as Ocegueda et al. (2022), New technologies and tools are being integrated into education as part of the methodology, without this being separate from technological development. Therefore, it is essential for the teacher, although not necessarily to master all the tools, to have general knowledge and, above all, an openness to incorporate ICT tools both in the teaching of the class and in promoting their use among the students.

The revolution in digital tools has recently incorporated the use of Artificial Generative Intelligence (IAG). In less than a decade, its influence on architectural design has begun to be noticed. AGI is an aspect of artificial intelligence that focuses on generating completely new data or content from existing ones using machine learning algorithms and data from datasets (Mantengna, 2020).

Regarding the plagiarism of intangible assets such as artistic and literary creations, it is essential to highlight that security and transparency in copyright management are being supervised and protected through new tools such as (Kuznetsov, Sernani, Romeo, Frontoni, & Mancini, 2024). These tools seek to establish new regulations, which is essential for communicating with students.

Regarding its application, specialists indicate that the use of this technology in architectural design is based on the user's ability to provide commands or instructions, known as "prompts," of text that AI programs can recognize (Beyan & Rossy, 2023). It is at this point that semiotics becomes relevant again. Some examples of GAI include Bluewillow, Craiyon, Dalle-2, DreamStudio, Firefly, Hotpot - AI Art Maker, Midjourney, Nightcafe, and StableDiffusion Web (Basteros, 2023).

It must be considered for use IAG; there is an appropriate programming lexicon, which, although at the beginning they may be ordered based on their criteria, later on, the user, if they wish to specialize, must analyze guides to determine the appropriate prompts, negative prompt, style, upload image and setting (prompt strength, noise, seed, model) that recreate the product suitable to your needs. The manuals or tutorials offered by the different AI services are free (Stability.ai, 2022; Craiyon, 2023; Stable, 2023). However, the new generation of ChatGTP 4, according to Törnberg (2023), implements a new Large Language Model (LLM), which allows correctly correcting messages that require reasoning based on contextual knowledge and inferences about the author's intentions, traditionally seen as unique human abilities. With this, it offers that, through a simple command, the appropriate prompts are generated for generating images and videos in IAG, avoiding noise errors, barriers, and channels and improving the semiotics between both (architect [user] - IAG). New lines of research propose task data schemas to develop a new language, such as in the interaction between design and model manufacturing, called co-design (Skoury, y otros, 2024).

## Academic exercise proposal for architecture students

The academic exercise is aimed at students in the second semester of the Architecture Degree; its objective is the interior design of a social and community space, semi-open, contained between two buildings, which serves as a cafeteria in a university educational space. For students to interact with users and space, the actual space in this exercise is located in the Faculty of Communication Sciences, on the Mocambo Campus of the Universidad Veracruzana, Veracruz Region. The city and Port of Veracruz have a tropical climate, with rain in summer, classified as Aw2 (warm and humid climate greater than 55.3%) by Köppen-Geiger. The average annual temperature is 28 °C, with maximum and minimum values of 35 and 20 °C; the average, maximum, and minimum RH are 80%, 89%, and 67%, respectively, and average annual precipitation of 1516 mm/year, with maximum monthly values of 360 mm in July, also presents an increase in its temperature per decade of 0.59 °C (Grajeda-Rosado, y otros, 2022) (Fig. 2).

### Box 2



**Figure 2**

Process Photographs of the exterior space to be remodeled at the Faculty of Communication Sciences, at the Universidad Veracruzana

*Source: Own elaboration*

## Methodology

A qualitative research approach was used (Tamayo, 2007) since the collection of non-numerical data was previously sought to describe and refine the current phenomenological situation. According to Hernández et al. (2014), the study corresponds to an exploratory approach because, although there is an established problem, it is not clearly defined; that is, the study begins to understand it without providing conclusive results and, finally, it is descriptive because it analyzes the characteristics of the phenomenon and allows us to define, classify, summarize and determine a method to address the problem.

In the first part, the wording of the exercise was: Remodelling of the cafeteria space of the Faculty of Communications where students carry out actions such as having breakfast, homework, and recreational activities, creating a concept of identity in the users, with the conditions of not subdividing the space, use of university institutional colors, and develop proposals for improvement in visual and thermal comfort. Therefore, the expected final result has as its rubric that the teams generate an innovative and unique proposal, qualifying that they consider aspects of functionality and global image of the space with its environment, creativity, coherence in its textual and visual discourse, as well as the introduction of basic bioclimatic techniques, which will be valued, not only by the subject teachers but by the authorities of the educational establishment and the users themselves.

The proposed methodology for the academic activity carried out by first-grade students is divided into four stages.

- The first stage has two types of communication interaction: informal and formal. The first is direct contact with the users of the space and internal collaboration between communication scientists and architects, who must analyze and understand their collective imagination of the space. This communication is carried out with colloquial language and has no restrictions. The product expected by future architects is the guiding idea, with graphic representations using manual techniques.

- The second stage provides formal communication to the architect through a Brief, Branding, and Corporate Identity document prepared by the Communication degree students, which refines the architectural project proposal.
- Subsequently, knowing all this information, with a product prepared with traditional teaching-learning methods, the teams were encouraged to use AI, using primary technical language, to obtain new images and design suggestions. The expected product is graphical representations using digital techniques with IAG.
- Finally, a physical model, a scale model, was requested, which allowed us to perfectly understand the three-dimensional space and the team's final proposal.

## Results

The results varied significantly, heavily influenced by the students' individual styles and backgrounds. Nonetheless, certain consistent elements, such as the utilization of green and blue, align with the university's institutional image. Another notable aspect of the project was the necessity to convey "theories of communication," a concept strongly emphasized by both users and collaborators due to the proposals being deeply embedded within the faculty that teaches said program.

### *Informal communication and graphic representation with manual technique*

The outcomes exhibited considerable diversity, strongly influenced by each student's unique personal style and individual background. However, certain constants, such as the use of green and blue colors, are integral to the university's institutional image. Another distinguishing feature of the project involved the imperative to convey theories of communication, a concept highly sought after by users and collaborators, as the proposals are deeply rooted within the faculty that instructs the aforementioned program (Fig. 3).

### Box 3



**Figure 3**

Products of the first stage of Architecture students, Universidad Veracruzana

*Source: Own elaboration*

### *Formal communication (Communication techniques)*

The next step is formal communication, which becomes the concretization of the idea. This part of the information is the Brief generated by communication students. This document complements the information of the architecture student and brings him closer to the possibility of a sales project, seen from a marketing point of view.

- The information provided consists of four points: a) diagnosis, emphasizing where the project is culturally immersed, such as the student environment, beliefs, and values; concretizing the governing concept or idea (Fig. 4)



- b) Benchmarking, locating the specific dimension of the product or service, where the emotional benefits of the public are questioned, in this case, a survey was carried out whose results demonstrated the needs of users to express themselves openly, avoid stress and seek entertainment; without leaving the functional ones that are comfort, tranquility and light.
- c) Stakeholders, who determined the interested parties and personalities that affect decision making, such as suppliers, clients, collaborators, administrators, and directors; and
- d) Customer journey map, which locates the space concerning its exterior, establishing the user's contact points with the brand, detecting weaknesses and improving efficiency and user experience (Fig. 5).

Box 4

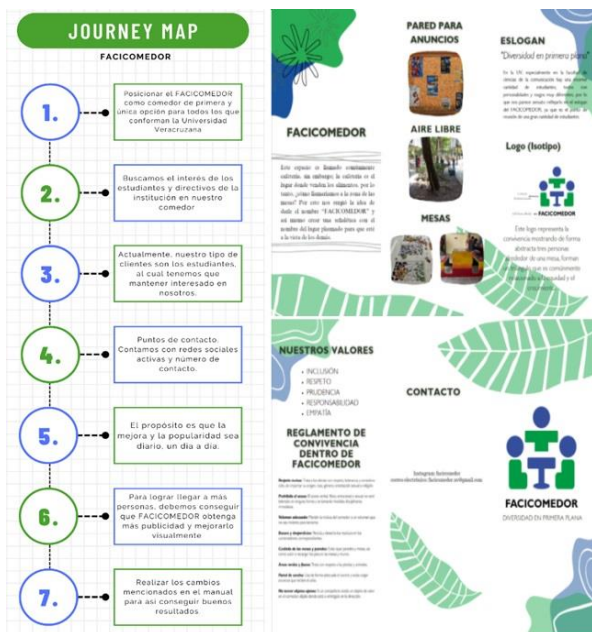


Figure 4  
Customer Journey Map

Source: Own elaboration

Conceptualization with IAG

The previous results show a firm intention to reflect the user's needs and express the personality of the future architect; however, AI allows for generating a new vision for the student. To achieve the desired results, the IAGs introduced different and equal prompts, covering negative, positive, short and long description commands, as well as creation by areas or walls.

Box 5



Figure 5  
Surveys and integrative project of the activities of the students of the Faculty of Communication Sciences of the Universidad Veracruzana

Source: Own elaboration

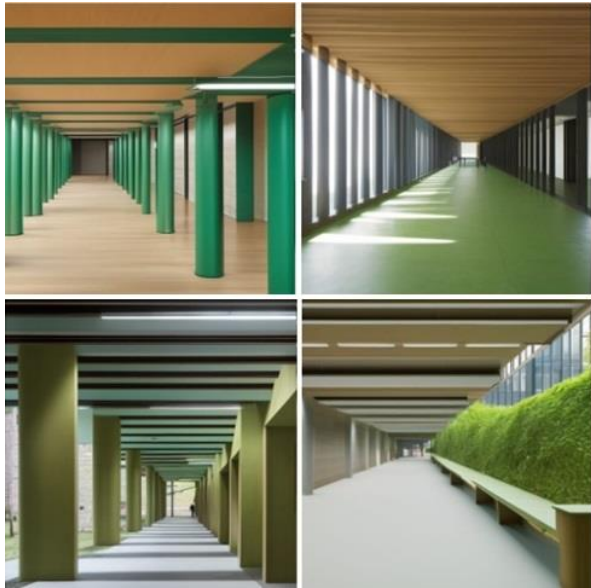
The results vary and depend not only on the order given but also on the type of artificial intelligence used; however, the results between Dream Studio and Blue Willow are similar. The "prompt" command used on the different IAG web pages generally mentions that the space is semi-open, with lighting, and in some cases, you are asked to add communication symbols. Below are the results obtained according to a specific program used and different applications of IAG.

IAG Dream Studio (Fig. 6).

Prompt utilized: Generate an architectural render of a space between two buildings with a school cafeteria. The buildings should have a modern design, allowing for seamless integration. Inside, the cafeteria features efficiently organized benches with built-in electrical connections for charging devices. Include green areas, a designated space for important announcements, strategically placed wall fans, and appropriate lighting.



**Box 6**



**Figure 6**

Images obtained from IAG Model SDXL Beta  
Source: Own elaboration

*IAG Night Cafe (Fig. 7).*

Prompt utilized: An open space between two buildings, with a hallway extending along it with green areas, 6 wooden tables in the central part, benches around the green area. The walls of the hallway are divided into 8 parts by columns with a mural representing communication career, using a green and blue line of 1-meter thickness.

**Box 7**



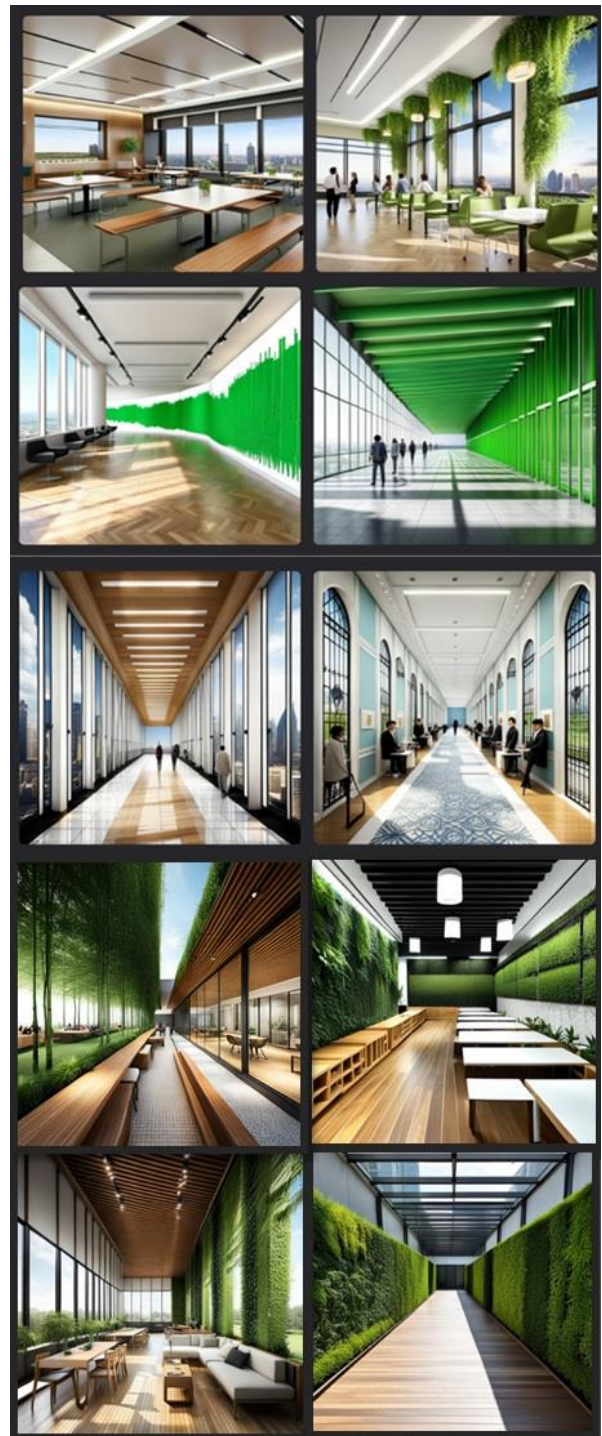
**Figure 7**

Images obtained from IAG Night Cafe  
Source: Own elaboration

*IAG Model SDXL Beta (Fig. 8).*

Prompt utilized: An open space between two buildings of 26 meters long and 7.8 meters wide, with a hallway extending along it with green areas, 6 wooden tables in the central part, benches around the green area. The walls of the hallway are divided into 8 parts by columns with a mural representing communication career.

**Box 8**

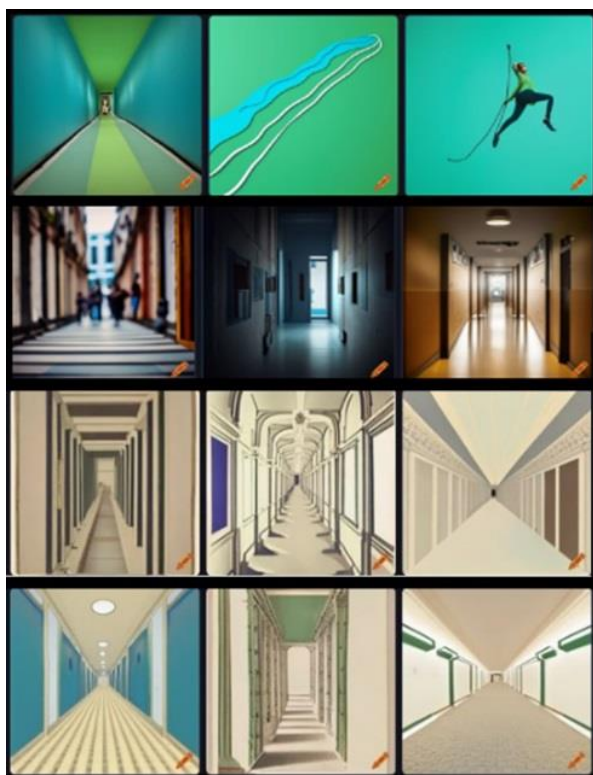


**Figure 8**

Images obtained from IAG Dream Studio  
Source: Own elaboration

*IAG Craiyon (Fig. 9).*

Prompt utilized: School hallway 7 meters wide and 26 meters long, with a continuous green and blue line painted on the walls and forming symbols that represent the communication degree. A long school hallway decorated with bachelor's symbols. The corridor is closed, the green area is simply green, with poor proportions and inadequate lighting, the corridor is located within a building.

**Box 9****Figure 9**

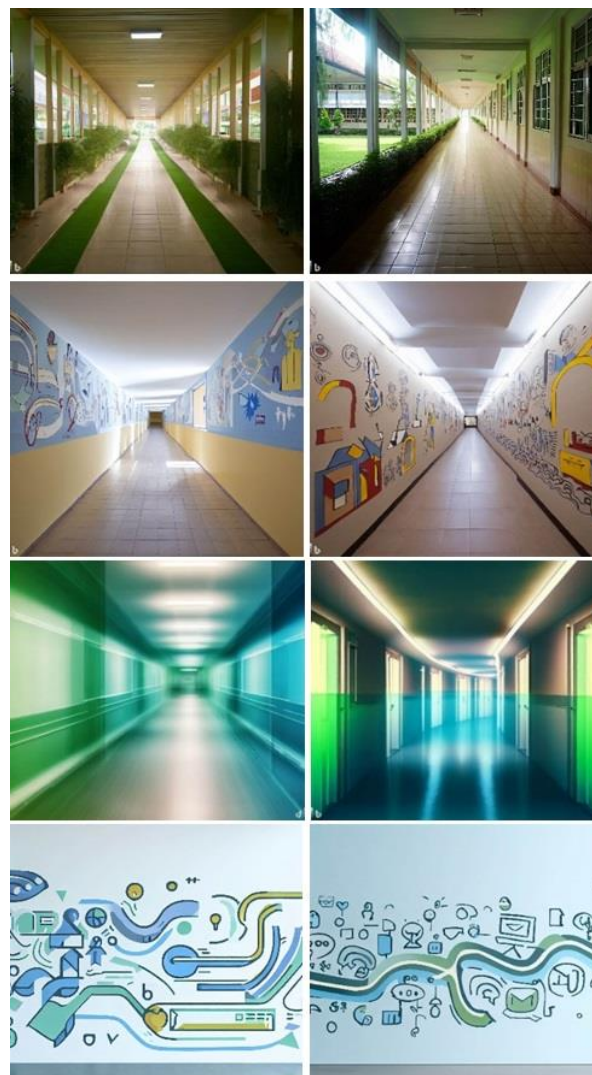
Images obtained from IAG Craiyon

Source: Own elaboration

*IAG Dall – E (Fig. 10)*

Prompt used: School classrooms with a 7-meter hallway with planters, 7-meter-wide school hallway, with green areas at the beginning and end of the hallway.

Prompt used: School hallway 7 meters wide and 26 meters long with murals on the walls representing the degree in communication through symbols and curved lines.

**Box 10****Figure 10**

Images obtained from IAG Dall-E

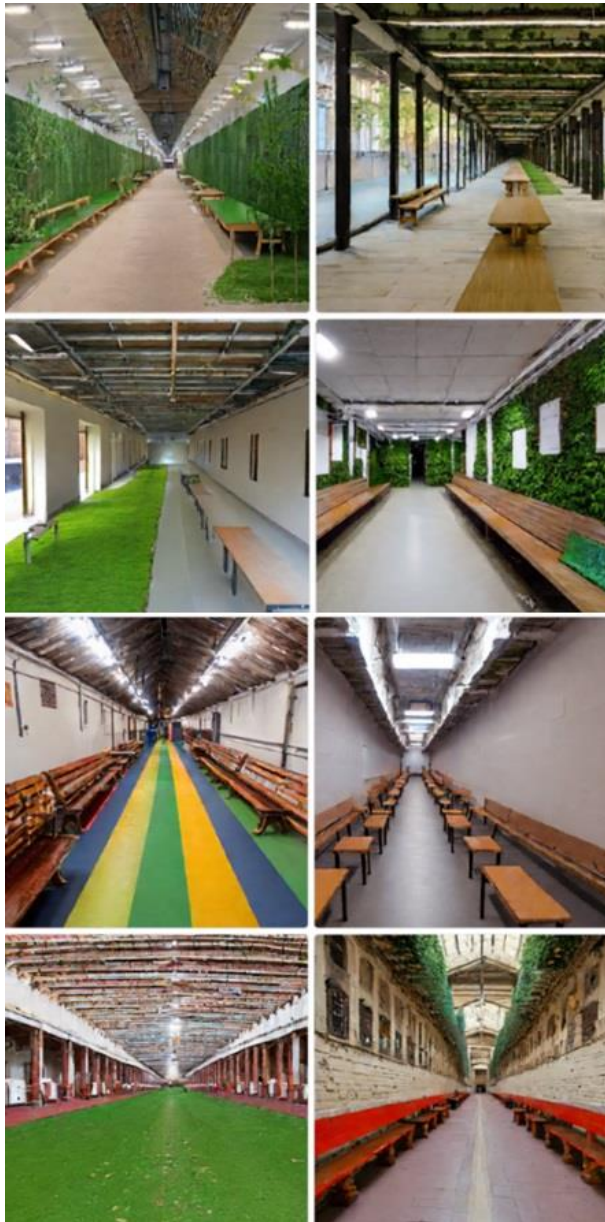
Source: Own elaboration

*IAG Stable Diffusion Web (Fig. 11)*

Prompt utilized: An open space between two buildings of 26 meters long and 7.8 meters wide with a hallway extending along it with green areas located at the beginning and end of the hallway. Benches are placed around the green area to delimit it, leaving a small space for people to pass and trash cans on each side. The walls of the hallway are divided into 8 parts by columns, they are ivory colored with a mural that represents the communication career, using a single line of 1 meter thickness, green and blue in color that extends throughout the wall, and which forms abstract symbols such as a camera, a hearing aid, and a microphone.



**Box 11**



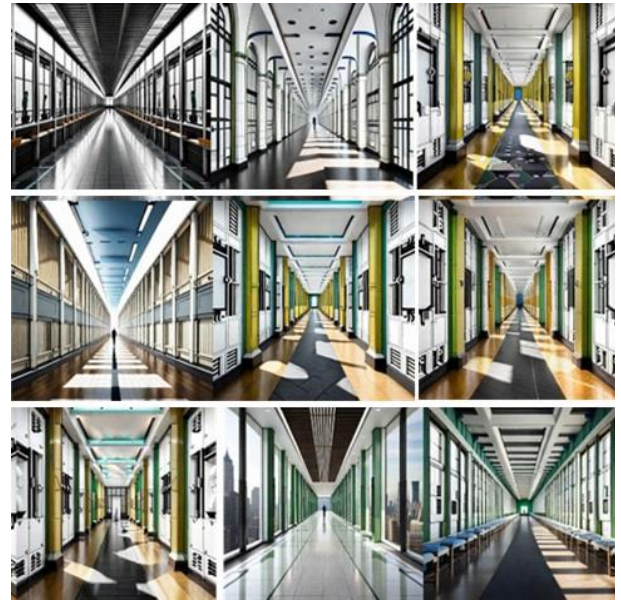
**Figure 11**

Images obtained from Stable Diffusion Web  
 Source: Own elaboration

*IAG Blue Willow (Fig. 12).*

Prompt utilized: A 26.14-meter long by 7.67-meter-wide corridor bordered by 2.5-meter-high walls on each side and a ceiling with rectangular white light fixtures. Each wall is divided into 8 sections by columns, the walls will be painted in ivory color, and each wall will have green and blue graphics representing a camera, a microphone, and headphones formed by a continuous line along the wall. In the center of the corridor, there will be 6 square wooden tables with wooden benches.

**Box 12**



**Figure 12**

Images obtained from IAG Blue Willow  
 Source: Own elaboration

*IAG Adobe Firefly Beta (Fig. 13).*

Prompt utilized: A school corridor bordered by walls on each side and a ceiling with rectangular white light fixtures. The walls will be painted in ivory color and each wall will have green and blue graphics representing a camera, a microphone, and headphones formed by a continuous line along the wall. In the center of the corridor, there will be 6 square wooden tables with wooden benches.

**Box 13**



**Figure 13**

Images obtained from Adobe Firefly Beta  
 Source: Own elaboration



*Physical model (mockup)*

Models in architectural design are visual and tactile tools that allow architects and designers to represent their ideas and projects in a three-dimensional way. They are useful for visualizing and communicating spatial concepts, volumes, proportions, and architectural details in a more tangible and understandable way. Furthermore, the models were the evidence that allowed us to evaluate the relationship between the different elements of the design, facilitate the visualization of the academic exercise's results, and determine whether the communication with the users and all those involved in the architectural project's design was effective. That is why, behind all the information provided by the communicologists and the search for ideas with IAG, the architecture students proceeded to make a model, scale 1:25. Where they expressed their ideas/concepts and allowed us to distinguish the evolution of the final idea/concept (Fig. 14).

**Box 14****Figure 14**

Products of the third stage of Architecture students, Universidad Veracruzana  
*Own source*

*Software and IAG combination*

Finally, we have experimented with the use of the SketchUp software, which works as a rendering tool, where the basic shapes of the 3D model must mainly be made so that, using its plug-in, Veras can determine the details that will be added through the prompt.

The interface called Veras, an AI-powered visualization plugin for SketchUp®, Revit®, and Rhinoceros®, uses the geometry of your 3D model as a substrate for creativity and inspiration, with the use of PROMPTS (instructions) that influence the results obtained by the IAG, which seeks to represent the instructions in 3D view.

According to its creators, Veras is not a simple rendering tool. They define it as an exchange of “ideas” between architects and designers who seek to complement and iterate in seconds to refine the options and obtain innovative solutions. As the program manual indicates, first, the student models the building structure or form, opens the Vera platform, and enters the prompt (Fig. 15).

**Conclusions**

Semiotics and semantics are fundamental concepts in architectural design. They facilitate the effective communication of meaning and establish connections with users. By consciously incorporating this knowledge, architects can create social and community environments that resonate with users and elicit meaningful responses.

In addition to this, we integrate the management of communication techniques, such as Branding, which facilitates clearer communication patterns and reduces noise in the interaction between architectural design and user needs. However, this document must be prepared by a specialist and may not always be provided by the client. Through these elements, we can establish the corporate identity of the social space to be remodeled, viewed from a marketing perspective.

**Box 15****Figure 15**

Images obtained with SketchUp Software and IA Veras Prompt used: concrete hallway, grassy area, ivory walls, aluminum windowpanes, wooden doors, wooden tables, stairs at the end of the hallway.

*Source: Own elaboration*

**No AI application**

In relation to the results of communication between individuals informally and formally, we can say that the first allows us to create an excellent concept attached to what the user is looking for; however, the creation of ideas graphically is still limited by the architectural apprentice and the techniques that have not been used.

When waiting for the brief and with the information already obtained, creating the model is undoubtedly the best result for presenting the idea. This type of exercise puts in context for students the difficulty of managing communication with the user and all the processes that have to be carried out without any noise. In addition, it opens the way so that when using 2D and 3D representation software, they can realize their idea in the expected way since, if noise appears in the communication, the student cannot really execute the idea.

The important points that the students expose in this experience and academic activity are the difficulties that can be had with the user's communication, both formally and informally. This helps the student foster empathy and social skills, as well as impartial and expeditious responses, which every architect should have, and educational programs should encourage.

**AI application**

It has been observed that utilizing artificial intelligence in image generation could offer a promising avenue for exploring linguistics in architectural learning and facilitating the ideation process through guiding images. However, the results are far from a conclusive project for delivery, which is why it allows us to create concepts, but they must be worked on to reach a final product. The results vary depending on the AI used because the programming language used is unknown. This disrupts the writing and the expected result. The discrepancy may arise from the student's limited proficiency in technical language or disparities between contexts, resulting in significant interference.

The context can influence images, that is, the collective consciousness of the images or the fashion in which this information is immersed. Even the IA website reports that the results are only based on information obtained from recent years; they vary according to the selected IAG. The students commented concerning the use of the IAG that the results can be delayed, depending on the cost of the service, and that experimentation can be frustrating when seeking a specific objective and, in this case, the development of interior design projects, preferably it is better to work previously with a 3D model; report that the generation of external shapes is more accessible to conceive with the IAG.

Applied in the learning process, the students understood the difference between informal and formal language and how communication aspects become more specific and directional from the user, regardless of a project's technical or regulatory restrictions. Communication between user-architect-AI is an unavoidable link in design; until now, the architect must interact with the AI as a bridge between the clients. It is significant to highlight the importance of ethics in using these tools and establish whether we are information providers, communication tools, or content creators since the results are language models mediated by AI.

The emergence of a need is the beginning of every communication and architecture project because it represents the opportunity to create an innovative and highly functional solution. The materialization of an architectural project, from its initiation phase to the remodeling processes, requires methodological steps that encompass criteria of the trinomial: functional, aesthetic, and structural, and currently, the environmental aspect is adhered to. Initially, it is necessary to define the nature of the project and begin with the analytical phase that involves physical context conditions, program determination, and cultural and social conditions.

This is where the generation of ideas begins, where concepts are born, rooted in technique and geometry. These ideas can be translated into architecture through concepts founded on the integration of elements and design principles. However, throughout the process, linguistics (meaning-signifier) plays an essential role in guiding proposal development.

For instance, prior to modernism, projects adhered to a set of rules, codes, and lexicon, where the resulting work ensured its permanence through dialogue. Subsequently, modernism introduced new languages, influenced by the architect's personal temporal context and their degree of openness to external influences, culminating in the digital age (Muñoz-Cosme, 2018). At this stage, the incorporation of digital tools alters the perception in the methodology of stages two and three. As Champitaz (2020) suggests, client interaction constitutes the social aspect of design, a linguistic language that must be loaded with empathy and assertive signifiers of the two previous stages, which cannot be replicated with AI.

In the present study, the results of an academic exercise that integrates three types of communication channels: User-(informal communication)-Architect, Architect-(formal communication)-AI, and User/collaborator-(formal communication)-Architect. This integration aims to gather students' assessments, determine potential improvements in the teaching model, and responsibly and ethically promote the use of AI tools in learning strategies, without sacrificing skills such as the ability to efficiently conceptualize space in three dimensions.

The primary contribution involves integrating multidisciplinary teams in project development, optimizing execution times, and maintaining effective communication with users while utilizing AI tools.

## Declarations

## Conflict of interest statement

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

## Author contribution

*Grajeda-Rosado, Ruth María:* Conceptualization, architectural formal analysis, funding acquisition, research, methodology, software, visualization, writing: original draft, writing: review and editing



## Article

*Rosello-Luna, Alma Saraí:* Conceptualization, formal analysis of Communication Science, acquisition of funds, methodology, research, methodology, writing: review and editing

*Vázquez-Torres, Claudia Eréndira:* Conceptualization, Methodology, Writing – review & editing.

*Sotelo-Salas, Cristina:* Conceptualization, architectural formal analysis, Writing – review & editing.

### Availability of data and materials

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

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### Abbreviations

AI Artificial Intelligent  
GAI Generative Artificial Intelligence  
LLM Large Language Model

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