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TEACHING DESIGN IN BRAZIL BASED ON THE STUDY OF WORKS BY JOÃO FILGUEIRAS LIMA

ENSINO DE PROJETO NO BRASIL A PARTIR DO ESTUDO DE OBRAS DE JOÃO FILGUEIRAS LIMA

ENSEÑANZA DEL DISEÑO EN BRASIL A PARTIR DEL ESTUDIO DE LAS OBRAS DE JOÃO FILGUEIRAS LIMA

Figure 0. Outline of the summary panel by Group 9 based on the analysis of the Vítoria TCU. Source: The authors.

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RESUMO

O artigo apresenta uma experiência de ensino de projeto arquitetônico baseada no estudo de obras pré-fabricadas do arquiteto brasileiro João Filgueiras Lima, o Lelé (1932-2014). O ateliê de projeto foi realizado no âmbito de uma disciplina optativa do curso de arquitetura e urbanismo da Universidade Federal de Santa Catarina. O objetivo principal foi apresentar um método de estudo da arquitetura por meio da investigação aprofundada de um edifício, valendo-se do redesenho como instrumento analítico e crítico, bem como da aplicação dos elementos estudados em um exercício projetual propositivo. Para tanto, o curso foi estruturado a partir da compreensão de um conjunto de soluções desenvolvidas por Lelé, utilizadas como matriz para o redesenho de edifícios previamente selecionados e para a formulação de novas propostas de projeto voltadas a uma demanda comum aos estudantes: um pavilhão dedicado à convivência e à permanência estudantil na universidade. Optou-se por um recurso pedagógico de projeto que busca sensibilizar para a arquitetura a partir da imersão em um legado arquitetônico fortemente vinculado ao contexto brasileiro, incorporando questões sócio-históricas, ambientais e tecnológicas. Os trabalhos apresentados evidenciam a adaptação dos elementos pré-fabricados concebidos por Lelé a diferentes situações, em virtude de sua coordenação modular, adaptabilidade e flexibilidade. Observa-se, ainda, a utilização da modulação e dos elementos construtivos presentes nos edifícios analisados, bem como de aspectos projetuais recorrentes, tais como pátios internos, passagens cobertas, definição dos fluxos e distribuição dos ambientes. Tais características reforçam que a obra de Lelé possui um caráter profundamente didático e que seu estudo em disciplinas de graduação em arquitetura favorece a assimilação integrada de aspectos projetuais e tectônicos. Nesse sentido, cabe aos docentes proporcionar aos estudantes experiências de aprendizagem baseadas na práxis, orientadas pela análise crítica de obras arquitetônicas, pela verificação de hipóteses e pela realização de exercícios de natureza propositiva.

Palavras chaves: ensino, projeto arquitetônico, desenho, pré-fabricação, metodologia de projeto

ABSTRACT

The article presents an architectural design teaching experience based on the study of prefabricated works by Brazilian architect João Filgueiras Lima, or Lelé (1932-2014). The design studio was carried out as part of an elective course in architecture and urbanism at the Federal University of Santa Catarina. The main objective was to present a method for studying architecture through an in-depth investigation of a building, using redesign as an analytical and critical tool, and applying the elements studied in a propositional design exercise. To this end, the course was structured around the understanding of a set of solutions developed by Lelé, used as a matrix for redesigning previously selected buildings and for formulating new project proposals aimed at a demand common to the students: a pavilion dedicated to students spending time together at the university. A pedagogical design resource was chosen to raise awareness of architecture through immersion in an architectural legacy strongly linked to the Brazilian context, incorporating socio-historical, environmental, and technological matters. The works presented show the adaptation of the prefabricated elements designed by Lelé to different situations, due to their modular coordination, adaptability, and flexibility. There is also the use of modulation and constructive elements in the buildings analyzed, as well as recurring design aspects such as internal courtyards, covered passages, definition of flows, and distribution of environments. These characteristics reinforce the fact that Lelé's work has a profoundly didactic character and that its study in undergraduate architecture courses favors the integrated assimilation of design and tectonic aspects. In this sense, it is up to teachers to provide students with learning experiences based on praxis, guided by the critical analysis of architectural works, the verification of hypotheses, and the performance of propositional activities.

Keywords: teaching, architectural design, drawing, prefabrication, design methodology

RESUMEN

El artículo presenta una experiencia de enseñanza de proyectos arquitectónicos basada en el estudio de obras prefabricadas del arquitecto brasileño João Filgueiras Lima, conocido como Lelé (1932-2014). El taller de proyectos se llevó a cabo en el marco de una asignatura optativa del curso de arquitectura y urbanismo de la Universidad Federal de Santa Catarina. El objetivo principal fue presentar un método de estudio de la arquitectura mediante la investigación en profundidad de un edificio, utilizando el rediseño como instrumento analítico y crítico, así como la aplicación de los elementos estudiados en un ejercicio de diseño propositivo. Para ello, el curso se estructuró a partir de la comprensión de un conjunto de soluciones desarrolladas por Lelé, utilizadas como matriz para el rediseño de edificios previamente seleccionados y para la formulación de nuevas propuestas de proyecto orientadas a una demanda común a los estudiantes: un pabellón dedicado a la convivencia y la permanencia de los estudiantes en la universidad. Se optó por un recurso pedagógico de proyecto que busca sensibilizar hacia la arquitectura a partir de la inmersión en un legado arquitectónico fuertemente vinculado al contexto brasileño, incorporando cuestiones sociohistóricas, ambientales y tecnológicas. Los trabajos presentados evidencian la adaptación de los elementos prefabricados concebidos por Lelé a diferentes situaciones, gracias a su coordinación modular, adaptabilidad y flexibilidad. También se observa el uso de la modulación y los elementos constructivos presentes en los edificios analizados, así como aspectos recurrentes del diseño, tales como patios internos, pasillos cubiertos, definición de los flujos y distribución de los ambientes. Estas características refuerzan que la obra de Lelé tiene un carácter profundamente didáctico y que su estudio en disciplinas de pregrado en arquitectura favorece la asimilación integrada de aspectos proyectuales y tectónicos. En este sentido, corresponde a los docentes proporcionar a los estudiantes experiencias de aprendizaje basadas en la praxis, orientadas por el análisis crítico de obras arquitectónicas, la verificación de hipótesis y la realización de ejercicios de naturaleza propositiva.

Palabras clave: enseñanza, proyecto arquitectónico, diseño, prefabricación, metodología de proyecto

AS / Vol 43 / Nº 68 / 2025
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INTRODUCTION

This article presents a design workshop experience grounded in project practice, drawing on a study of prefabricated works by João Filgueiras Lima, also known as Lelé (1932-2014). The workshop was held as part of an optional course in architecture and urbanism at the Federal University of Santa Catarina (ARQ-UFSC). Led by Professor Eduardo Westphal, it was supported by the Faber Group - Architecture, Construction, Technology and Heritage, based at the Faculty of Architecture of the Federal University of Bahia (FAUFBA), which has researchers from several higher education institutions in Brazil. First, issues related to teaching and learning design, construction prefabrication and industrialization, modern architecture, its fragility, and the need for its preservation are raised. The issue of project teaching is then problematized, presenting the theoretical assumptions underlying the pedagogical strategy adopted here. After this, relevant aspects of Lelé's prefabricated architecture are highlighted. Finally, the subject's methodological path is presented, including its stages, before discussing the results and their possible implications.

The idea of conducting a project workshop based on a detailed analysis of works stemmed from a question about how students have used design references in undergraduate design exercises. These references are primarily understood as an illustrative gallery of materials, colors, and shapes found in photographs and digital perspectives, without establishing a deeper understanding of design logics, spatial organization, or the tectonics of the sample buildings. Given this, it was decided, at first, to propose a design exercise guided by the selection of works of recognized architectural quality that were, simultaneously, didactic in conception and provided sufficient information for an in-depth analysis. In this sense, Lelé's works meet these initial assumptions, as we will expand upon below.

The architect João Filgueiras Lima is recognized as one of the most relevant names in the field of building prefabrication and industrialization in Brazil. Over more than fifty years, Lelé developed prefabricated systems, designing and constructing buildings using standardized components. From the first experiments during the construction of Brasília in 1960 to the 2010s, Lelé researched and developed several construction systems using reinforced concrete, steel, and mortar. In most of his works, the sheds - Zenith lighting and ventilation elements -, combined with closing panels, light structural elements, the expressive use of colors, and the incorporation of the art of Athos Bulcão, contributed to consolidating an unmistakable and internationally recognized architectural language. According to Vilela (2019, p. 250), Lelé, over decades, developed a modus operandi that has been tested and refined through constant

AS / Vol 43 / Nº 68 / 2025
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transformation, creating a know-how that needs to be understood and protected.

The light, flexible, tectonic, modular, and serialized architecture developed by Lelé outlines possible paths, suggesting that certain precepts of architectural modernity remain valid. Lelé has also always considered aspects of the production chain, including reducing waste and resource use, low-cost environmental comfort strategies, and prioritizing locally developed, locally produced products. Another notable aspect is the social relevance of his architectural legacy, which addresses demands related to people's fundamental rights – core topics in the formation and professional practice of architecture. Throughout his work, characteristic patterns of serial prefabricated systems are identified that can adapt to different conditions, including categories, programmatic scales, locations, and deployment. Thus, the study of these logics leads to understanding a design system based on recursion applied to the space-form-component triad.

In the context of architecture and urbanism education, analyzing and synthesizing Lelé's works can significantly enrich the teaching and learning of design. Thus, using an investigative process in which students follow paths already trodden by Lelé, it is sought to expand and strengthen the foundations of the students' project. By understanding the logic of prefabrication in Lelé's work, an approach is sought that aligns with Waisman's (2020) reflections on the relationship between technology and modernity, and is oriented toward regional architecture. If, according to Waisman, there is a schematism in much of current architecture, starting to be conceived in photogenic terms, in Lelé's work, the concept of "advanced technology" described by it is identified, insofar as Lelé was concerned both with understanding local circumstances and with the scope, repeatability, and recomposition of the systems developed by him.

However, this path is not intended to imitate the form of a consecrated master, nor to be based on what Corona Martinez calls "donors of forms" (2000, p.78). IInstead, it is a pedagogical design resource that seeks to raise awareness of architecture, based on an architectural legacy closely tied to the Brazilian context, considering socio-historical, environmental, and technological issues, as a way to bring students closer to prefabrication and industrialization practices of construction and, at the same time, to know and recognize Lelé's works as constituents of a modern heritage to be safeguarded or, as Montaner (2023, p.11) puts it, of an architecture that recovers and perpetuates "traditions that understood modernity as a promise of liberation and equality."

AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
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Therefore, the workshop reported here aimed to conduct a teaching and learning experience through a project that sought to understand a set of solutions developed by Lelé, using them as a basis to prepare new project proposals addressing a common student demand: a pavilion dedicated to student coexistence at the University.

The specific objectives, in turn, comprise:

- A project analysis and synthesis exercise based on the redesign of Lelé's referential works;
- The discussion of issues related to prefabrication and industrialization of construction;
- Exchange between students, teachers, and researchers from different institutions;
- Recognition of Lelé's architectural legacy as modern heritage.

THEORETICAL FRAMEWORK

In architectural design practice, there is an alternation between analysis and synthesis processes. Cyclically, we can analyze the syntheses we elaborate. In this fertile field of architectural creation, doubt is desired. Therefore, the project's teaching must allow for doubt. As the architect Álvaro Siza mentioned, "it is necessary to maintain a kind of cloudiness – which is neither ignorance nor naivety – to escape an inevitable application of supposed solidified knowledge" (Zaera-Polo, 2015, p.152). On the other hand, answers to many questions are not limited to institutional spaces and school rules, as the construction of a personal repertoire extends beyond the educational environment. The acquisition of knowledge begins with the first interactions with the environment we live in. In vocational training, however, a specific understanding of the craft is introduced. During the creative process, the architect draws on their experiences, incorporating them into their reflections and analyses to find solutions. As stated by the architect Paulo Mendes da Rocha (2007, p. 19), "if you are going to make a project, initially you must be able to invoke memory about knowing, even if you are not aware that you know." Rocha also states that architecture is a singular form of knowledge, something complex to define and easily degenerable. The architect, according to him, manages knowledge in a peculiar way.

However, part of the project's cloudiness may reflect contemporary production processes, which fragment the vision of architecture. The architect often does not engage with all stages of architectural making. Their work is almost always limited to the drawings that precede the work's materialization. Thus, the accumulation of design experience is restricted to expression through drawing or image. In this context, the one who masters the technique is not the one who designs. As Siza mentions:

AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
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> The tendency toward self-expression is inevitable; it is the bright yet immature phase of a project. This concerns an artificial separation between the design and construction phases, characteristic of the contemporary production process. [...] the reason for the low quality of a lot of contemporary architecture lies, to a large extent, in this division of labor... (Zaera-Polo, 2015, p. 160)

However, in the teaching of design, it is essential to sensitize students to the values of architecture and the production process, because otherwise their learning tends to be limited to their own creative gestures, often tentative and rooted in limited prior experience. Under a psychoanalytic approach to the creative process, it is known that "the subconscious uses a reservoir of experiences at its disposal in its projects and works" (Huskinson, 2021, p.153). The subconscious can break into creative insights, for example, emerging into the conscious mind. In this logic, it is possible to feed the subconscious with experiences that later become evoked by memory.

Getting to know Lelé's works through a process that involves their redesign and screening constitutes a strategy to support projects. It is about feeding students with sound principles of architecture and strengthening their design references, because, as Rocha says, when dealing with possible stimuli to creativity, "you can't do anything other than what you actually know" (Wisnik, 2012, p. 169).

The practice of redesign is not new and has been applied in architectural training since the beginnings of its directed teaching, which dates back to the 15th century and would go on to found the French academies of the 17th century. Architectural treatises, such as Giacomo Barozzi da Vignola's 1562 treatise, were widely used at the Imperial Academy of Fine Arts in Rio de Janeiro throughout the 19th century. If, historically, in artistic education, great masters were imitated by apprentices, in modernism, as stated by Corona Martinez (2000, p. 78), this practice began to be practiced in secret. This concealment can perhaps be understood as a repression of the conflict with academic classicism. On the other hand, as Piñon puts it,

> Someone who knows only the music they are capable of performing, and tries to train themselves in its practice, will eventually become accustomed to the primitiveness – if not clumsiness – of their babbling, and will lose all ability to recognize the attributes that characterize the quality of music. In the same way, the complicity of the student with the natural precariousness of their sketches makes them desensitized to architecture, so that as years go by – at the end of the studies- they are totally unable to distinguish what is good from what is not, if they do not mediate a legitimizing or condemning reasoning, which is usually based on a concept that – by definition- is incapable of recognizing the values of architecture. (Piñon Pallarés, 2005, p. 23)

AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
ISSN Digital 0719-6466

Bearing these questions in mind, we begin by examining João Filgueiras Lima's legacy in prefabrication and industrialized construction, considering the importance of the "responsible and socialized use of technology" in his work (Montaner, 2023, p. 11). The "know-how" of Lelé constitutes a patrimony to be protected (Vilela, 2019, p. 248), but, for this, this technology must be understood. In the academic context, scrutinizing Lelé's projects is a way to equip future architects with a design practice that considers the use of prefabrication technologies and contributes to the preservation policies of a material and intangible heritage, namely the works of João Filgueiras Lima and the technologies he continuously developed.

Drawing on concepts from the analysis and synthesis model of shape grammars can help understand the recurrence of solutions in industrialized construction systems, as Westphal (2007) demonstrated by describing the language of Lelé's hospital projects produced by the Centro de Tecnologia da Rede Sarah (CTRS). Definitions such as shape, vocabulary, rule, and structure form the basis of shape grammar. Similarly to the redesign, in shape grammar, a particular sample of buildings is decomposed from predefined criteria, reducing it to primitive forms - the vocabulary - and rules for combining these forms, capable of synthesizing all the analyzed buildings, as in the works of Koning and Eizenberg (1981) and Pinto Duarte (2005).

The optional project workshop course, called "João Filgueiras Lima: Projects with prefabrication," was structured from a logic of analysis and synthesis of projects, based on fundamentals of shape grammar, according to which, from the same matrix, differentiations between products arise, resulting from simple operations that combine the recursion of rules applied to sets of shapes and sizing parameters.

METHODOLOGY

The workshop was organized in three modules: Module 1 – Lectures on Lelé's works, given by several researchers from the Faber research group; Module 2 – Analysis of Lelé's referential projects and their constructive components; Module 3 – Architectural synthesis through the preparation of projects, based on the analyses carried out in the second module.

In short, from the lectures (Module 1) and the analysis and dissection, through the redesign of projects and their construction components (Module 2), an architectural synthesis is developed in Module 3 by identifying vocabulary and syntactic rules for prefabricated construction components, shapes, and spatial articulation. Despite the shape grammar methodology, given the discipline's schedule, the analysis of the works was carried out empirically, without the use of markers of rule application or

AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
ISSN Digital 0719-6466

graphic syntheses. Any ambiguities arising from the absence of these markers were resolved through teacher-guided guidance. Using Building Information Modeling (BIM) tools, students identified the constructive components of the works, represented them as families, and applied specific rules and parameters of Lelé's compositional systems. The activities carried out in each module are described below.

The first module consisted of four weekly meetings, in each of which two researchers from the Faber Group presented and discussed the architecture of João Filgueiras Lima from different perspectives. These public classes, held in a hybrid format with teachers online and students in the ARQ-UFSC auditorium, aimed to provide a theoretical and conceptual basis for Lelé's experiences with prefabrication and the industrialization of construction. The first session was attended by the professors Marieli Azoia Lukiantchuki from the State University of Maringá (UEM) and André Marques from Mackenzie Presbyterian University. Respectively, the lectures "Hospital architecture and the bioclimatic project: the lessons of Lelé" and "'Lelé greater than Le Corbu', what the walls say" were presented. Fábio Mosaner, from the Federal University of Pernambuco (UFPE), and Adalberto Vilela, from the Federal University of Uberlândia (UFU), then presented the lectures "Redesign of the Sarah Network Technology Center (CTRS)" and "Transition Elements: Sheds and marquees in Lelé's architecture", respectively. The third session featured professors José Fernando Minho and Ceila Cardoso from FAUFBA, who delivered the lectures "The Brazilian Institute of Habitat Technology (IBTH)" and "The Community Equipment Factory (FAEC) and Iansã". In the fourth and final session of the first module, Professor Sergio Kopinski Ekerman, from FAUFBA, and architect Michel Hoog Chaui Do Vale, PhD student at the Faculty of Architecture of the University of São Paulo (FAUUSP), presented, respectively, the lectures "The shapes of Lelé" and "Lelé in Salvador."

The presentations made throughout the first module addressed various aspects of Lelé's works, from socio-historical issues and technical and constructive aspects to environmental and perception attributes, as well as symbolic aspects related to the architectural legacy of João Filgueiras Lima and the recognition and preservation of modern heritage. These subjects, in addition to serving as a support to the following modules, aimed at the practice of the project workshop, brought to light contents underlying the reading of the graphic pieces of the discipline's base projects, allowing students to expand their analysis further (Module 2), as well as project decision-making (Module 3).

In the second module, of an investigative nature, referential works by Lelé were presented, characterized by prefabrication. The introductory class was based on the research "The Language of Hospital Architecture by João Filgueiras Lima" (Westphal, 2007), where constitutive aspects of a characteristic language of the hospitals of the Rede Sarah do Aparelho Locomotor system, designed by Lelé during his time at CTRS, are

AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
ISSN Digital 0719-6466

Figure 1. Mosaic of Lelé's buildings that this article illustrates in the works of the workshop: a) Colina residential complex, Brasília-DF; b) Rural school, Abadiânia-GO; c) Iansã Pavilion, Salvador-BA; d) TCU headquarters, Vitória-ES. Source: a) The authors; b) Risselada et al., 2010, p.62; c) The authors; d) Mosaner, 2021, p. 420.

addressed. Concepts of shape grammars were presented to support possible readings of Lele's other projects. Subsequently, a selection of photographs and drawings from 14 Lelé projects was exhibited for students' reference (Figure 1). All projects have been implemented with some degree of prefabrication. After the presentation, the teams selected the following works:

- Colina residential complex (1962), Brasilia;
- Service sheds of University of Brasilia (UnB) (1962), Brasilia;
- Rural schools of Abadiania (1982);
- Cresches Mais, Salvador (1987);
- Iansã Pavilion, Salvador (1987);
- Sarah Network Technology Center (CTRS), Salvador (1994-1997);
- Headquarters of the Federal Court of Accounts (TCU) of Salvador (1996);
- TCU Belo Horizonte headquarters (1997);
- TCU Victoria headquarters (1998).

It should be noted that the chosen projects are smaller and have shorter programs, enabling their analysis within shorter time frames, given that it is an optional discipline with only one weekly session. For this reason, hospital projects, except for the smaller Children's Rehabilitation Center, were not included in the list of suggestions, although they were presented and discussed in the module's introduction.

AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
ISSN Digital 0719-6466

The analysis of the projects was based on publications about João Filgueiras Lima's works, including books, dissertations, and theses. Some printed technical drawings of CTRS's works were also made available to students. During five sessions, the students worked in the workshop, redesigning the works and seeking to understand the role of the constructive components used, as well as the modular coordination and dimensioning of each system and each work. Among the works consulted by the students, in addition to books focusing on Lelé's production, the research of Ekerman et al. (2022) on Lelé's metal formwork, Lelé's primer with assembly guidelines for transitional schools in Goiás (Lima, 1984), Mosaner's thesis (2021) on The Sarah Network Technology Center (CTRS), Cândio Trigo's dissertation (2009) on Lelé's prefabricated components in reinforced mortar, as well as Westphal's dissertation (2007) on the language of hospital architecture produced at CTRS.

During one of the sessions of the second module, the class visited the Professor Barreiros Filho Municipal Library, built in 1988 by FAEC in the Estreito neighborhood of Florianópolis. This building is the result of the same system used in the Iansã Pavilion, from 1987, which was assembled at the Faculty of Architecture of the Federal University of Bahia (FAUFBA) and was recently restored in a process coordinated by members of the Faber Group. During the visit, the students were able to see the components of reinforced mortar up close, understand the logic behind variation and part assembly, and observe the modular coordination characteristic of the FAEC system.

At the end of this module, each team presented a panel in the workshop, printed on A1-size paper, featuring the redesign of their respective work, including plans, cross-sections, elevations, layouts, perspectives, and brief explanatory texts. The class rule was to use only drawings prepared by each team, adhering to the essence of the redesign process.

The final module aimed to summarize the analyses performed in module 2. Thus, it was up to each team to develop a project that applied the principles listed in the redesign of Lelé's works, testing their recurrence and expanding their understanding through propositional experience. A place and a program common to the class were defined using the principle of isonomy. Each team developed a proposal for a pavilion to be set up in front of the ARQ-UFSC building, at the site where the block nicknamed Pavilhinho is located, a remnant of the Department's provisional facilities, partially demolished and in a precarious state of repair. The Academic Center and the Model studio are located on this block, characterizing an important space of student permanence and representation. Thus, the proposed program should include spaces for student representation, permanence, and socialization at ARQ-UFSC, taking

into account dialogue with existing pedestrian flows and bioclimatic considerations. The choice of an open program also aimed to move away from a functionalist order, prioritizing spatial, constructive, and contextual decisions and seeking connections among places activated by people.

Again, the students worked in the workshop for five more meetings. In one of them, Professor Fábio Mosaner, from the Department of Architecture and Urbanism at UFPE, participated in person in the orientation sessions for the teams, highlighting technical, formal, and programmatic issues to consider in each project. At the end of the course, new A1 panels were presented, featuring each group's pavilion designs.

PROCESS

Using the lectures and available materials as an initial reference, the student groups began the redesign, first in sketches, to reveal the pieces' measurements and fittings. After the first sketches, the teams began, concomitantly, the redesign of digital models using the BIM (Building Information Modeling) tool. This tool helps students understand the constructive and tectonic aspects of buildings beyond the records in plans and cross-sections, since digital construction emphasizes the relationships between design, construction, tectonics, and materiality. In addition, the redesign methodology using digital models contributes to students' learning by requiring them to understand and systematize information about the elements that the studied buildings comprise.

As a result of the course, nine groups of students, organized in pairs or trios, presented two A1 boards each: the first, dedicated to the redesign of a Lelé building, the result of the analysis developed in module 2; the second, for the pavilion project attached to the ARQ-UFSC, prepared based on the constructive components studied.

Two groups analyzed projects featuring precast reinforced concrete systems molded on-site. The projects addressed were the UnB service shed (Group 1) and the Colina residential complex (Group 2). Lelé developed these projects at the University of Brasilia Planning Center (CEPLAN) between 1962 and 1964. The structure of these buildings consisted of a reduced set of precast elements. For example, in the Colina residential complex, the construction system consists of precast end pillars (precast piece 1), connected to molded pillars (vertical circulation boxes), and interconnected by precast double beams (precast piece 2), forming the main gantries. These gantries support secondary beams (precast piece 3), which, in turn, support the slabs (precast piece 4). Also noteworthy are the hollow closing panels (pre-molded part 5) and the opaque elements (pre-molded part 6). The analysis drawings prepared by

AS / Vol 43 / Nº 68 / 2025
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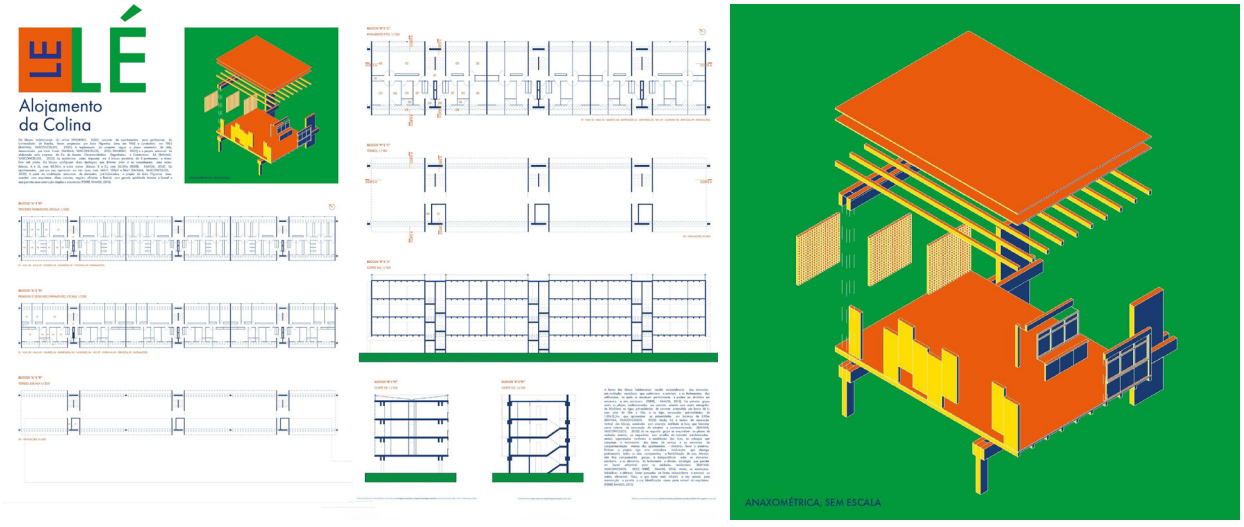

Figura 2. Outline of the analysis panel of the Colina residential complex, prepared by Group 2[1], with emphasis on the isometric perspective. Source: The authors.

Group 2 demonstrate an understanding of the construction system, presenting plans, cross-sections, and an isometric perspective (Figure 2).

In its summary project (Figure 3), Group 2 conceived an "L-shaped" building, subdivided into two blocks: Block A, parallel to the street, and Block B, perpendicular to the street, which configures the entrance square of the ARQ-UFSC. Both blocks have open ground floors, and the upper floors have subdivided units with light partitions, allowing for flexible layouts, in line with Lelé's project. Regarding the use of the elements analyzed in the Colina complex, the students describe, in the report presented in the summary panel, that "regarding the original project, the proposal maintained the modulation, the prefabricated structural system in concrete, the external seals and the vertical circulation system molded onsite, which also has a structural character".

However, in the original design, there is no 90-degree articulation, but only linear articulation. To address the perpendicular articulation of the blocks, the group resorted to a metallic trellis walkway, referencing Lelé's work, specifically the architect's walkways for the City Hall of Salvador. According to the report presented by the group, "the biggest difference in relation to the UNB housing complex consists of the addition of the walkway, conceived in a light metal structure to 'float' between the blocks, connecting them without causing great visual interference in the architectural setup proposed by Lelé."

Three buildings characterized by the construction system of lightweight prefabricated reinforced mortar were analyzed: the rural schools of Abadiânia-GO (Group 3), prepared by Lelé between 1982 and 1984; the Iansã Pavilion (Group 4) and Crèches

1 Students - Maria Júlia Kravulski Kormann and Matheus Alvarenga.

AS / Vol 43 / N° 68 / 2025
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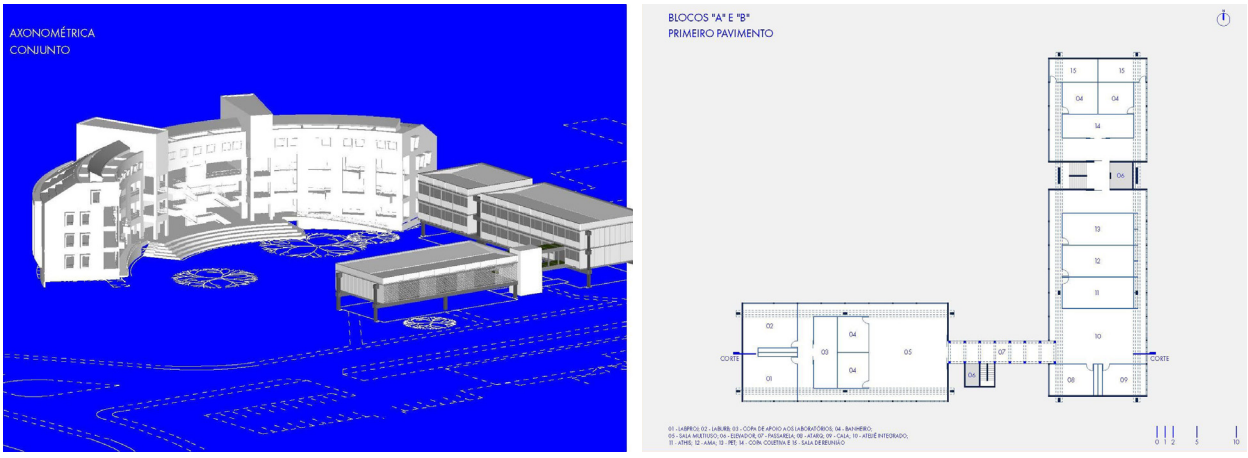

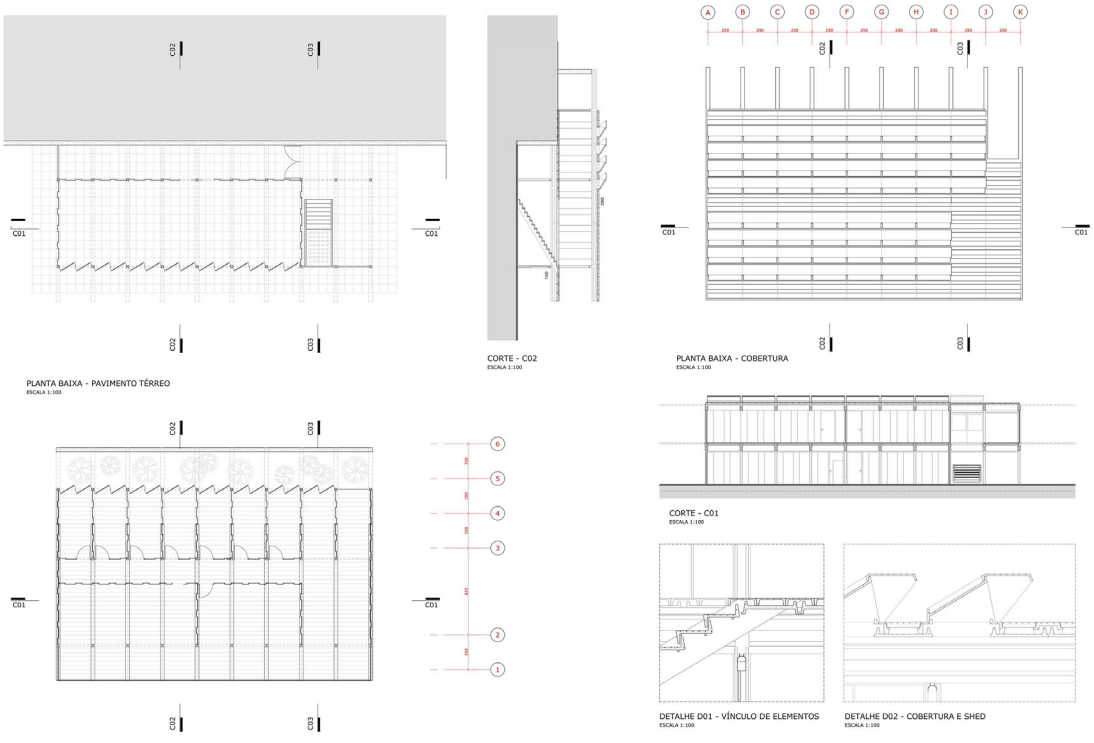

Figure 3. Outline of the project summary panel by Group 2, based on the analysis of the Colina residential complex. Source: The authors.

Figure 4. Outline of the Iansã Pavilion panel, prepared by Group 4[2], with emphasis on detailing the stair formwork, slab systems, and roofing for the sheds. Source: The authors.

2 EStudents - Diego Dias Caramez Rodrigues and Pedro de Souza Speck.

Mais (Group 5), both in Salvador – BA, developed by the Fábrica de Equipamentos Comunitários (FAEC), created and managed by Lelé for the city of Salvador between 1986 and 1989. These buildings are characterized by the use of lightweight reinforced mortar sections, with a level of design complexity significantly higher than that observed in heavy precast reinforced concrete. These experiments implied greater variation in sections, forming a complete construction system, with reinforced mortar as the predominant technique. The panel of the Iansã Pavilion (Figure 4), prepared by Group 4, presents plans, cross-sections, and details of the construction system, evidencing a modulation of 1.25 meters, as observed by the students during the redesign of these components

The project presented by Group 3 (Figure 5), which analyzed the rural schools of Abadiânia, was implemented in line with the schools'

AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
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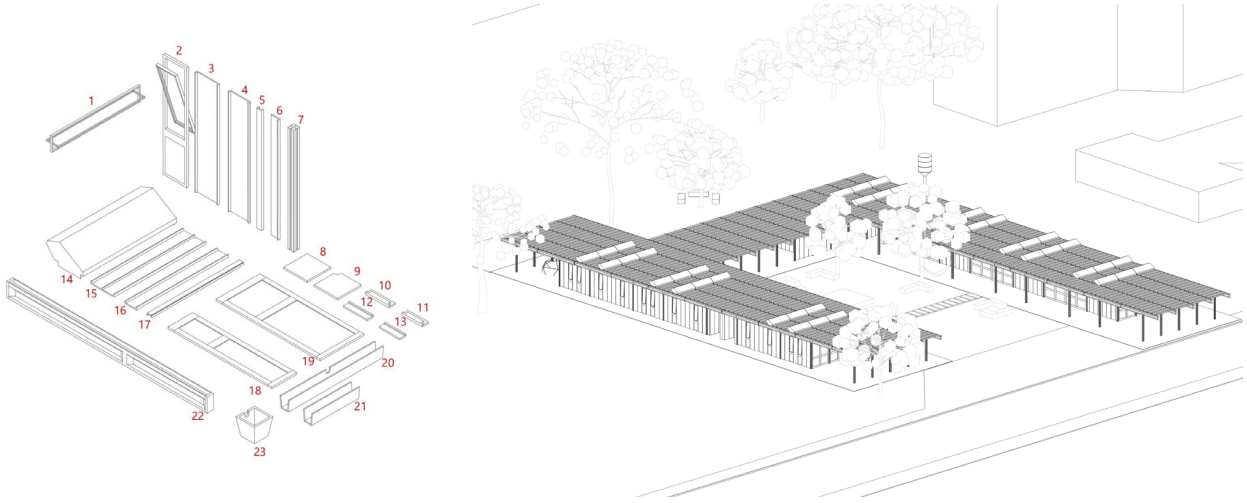


Figura 5. Outline of the project summary panel by Group 3[3], based on the analysis of rural schools in Abadiânia-GO. Source: The authors.

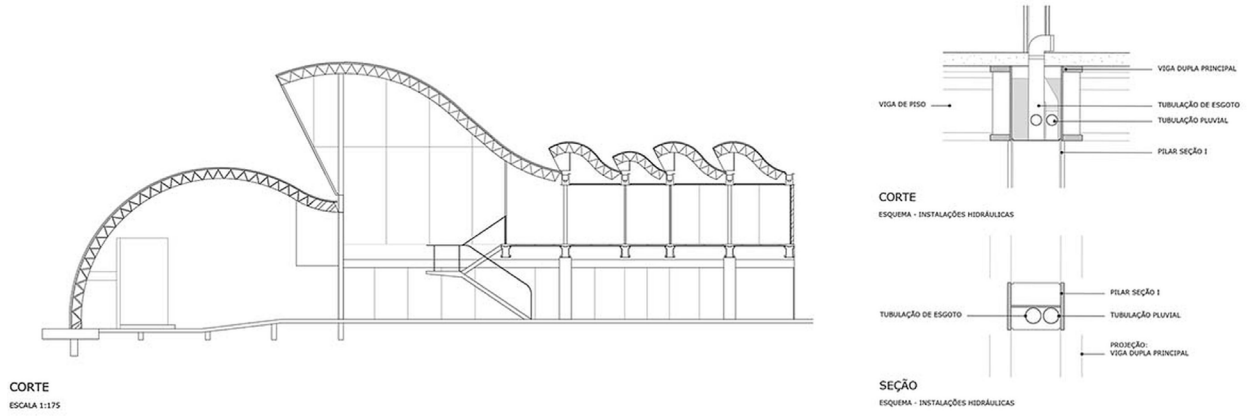
logic: single-story buildings with generous balconies for circulation, combining covered passages, internal courtyards, and enclosed rooms that act as islands. The roof system with Zenith lighting (sheds) allows flexibility in arranging the rooms in the covered area. As for the prefabricated elements, the family used in the studied project is observed, with the addition of new closing elements, such as windows and doors.

Four groups analyzed buildings produced at the Sarah Network Technology Center (CTRS). Group 6 approached the CTRS headquarters building itself, located in Salvador. Groups 7, 8, and 9, respectively, analyzed the buildings of the Federal Courts of Accounts (TCU) in Salvador (1996), Belo Horizonte (1997), and Vitória (1998). This center was conceived and directed by architect João Filgueiras Lima between 1992 and 2009, becoming the longest-lived facility under Lelé's direction. The CTRS was responsible for the construction and maintenance of buildings, the production of equipment and furniture for the Hospitals of the Sarah network, and the implementation of buildings through agreements with other public institutions, such as the Federal Courts of Accounts (TCU) (Mosaner, 2021). The construction system uses steel structures combined with lightweight, prefabricated, reinforced-mortar elements. Regarding the architectural language, one of the most striking elements is the design of the sheds, which have been progressively improved for natural cooling and ventilation.

In the redesign of Vitória's TCU, Group 9 presented the cross-section that best synthesizes the building, as it brings together all the roofing cases: smaller sheds, which illuminate and ventilate the living rooms on the top floor; a larger shed, for the entrance and atrium for the different rooms, associated with vertical circulation; and the arch that forms the auditorium roof, located on the ground floor. The group also detailed the joint between the "L-shaped" pillar and the double steel beam, which is considered one of the key nodes for understanding the construction system (Figure 6).

3 Students - Clara Bragança Boschiglia and Bruna Espíndola.

AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
ISSN Digital 0719-6466



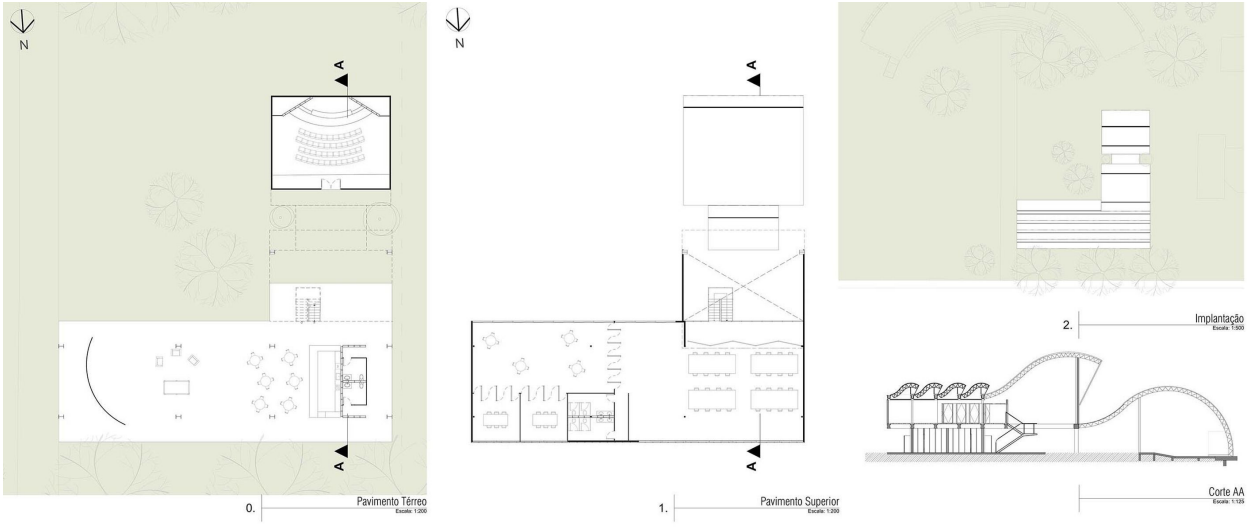


Figure 6. Outline of the analysis panel for the TCU headquarters building in Vitória, prepared by Group 9[4], with emphasis on the cross-section and the joint between the steel beam and the pillar. Source: The authors.

Figure 7. Outline of the summary panel by Group 9 based on the analysis of the Vítoria TCU. Source: The authors.

In the summary panel prepared by Group 9, the implementation of the "L-shaped" buildings was presented, with rooms distributed over two floors, an open ground-floor section, and an auditorium block. The implementation is similar to that at the current Pavilhinho location, where the auditorium occupies one of the legs of the "L," analogous to the TCU auditorium of Vitória (Figure 7).

4 Students - Bruna Honorato da Silveira, Carolina Aline Herpich Holdefer, and Matheus Vieira da Silva.

AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
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CONCLUSION

Despite the students' proposals, the objective of the discipline was not to propose an effectively executable design solution for that program and place, but rather to apply the constructive elements developed by Lelé. The first intention was to present a method of studying architecture through the in-depth investigation of a building, using redesign as an analytical tool and applying the elements studied to the project.

On the other hand, through the works presented, it was possible to verify the high adaptability of the prefabricated elements designed by Lelé to different situations, due to their modular coordination, adaptability, and flexibility, as well as their timeliness when addressing issues of prefabrication and environmental comfort. These questions reinforce that Lelé's work is also didactic and that studying it in undergraduate architecture disciplines enables integrated learning of project and tectonic aspects.

The recurrence of solutions that involve the constant improvement of design decisions through the evaluation of previous results led to a deliberate search in Lelé's works. In the words of the architect himself: "You have to repeat the experiences, but there is no point in exact repetition, but in repeating while evolving, adding, improving, improving. I think this issue of recurrence is fundamental." (Minho, 2025, p.11). This evolutionary view of recurrences reinforces the teaching and learning potential of a design analysis and summary of the project, grounded in the industrialization of construction. At the same time, such practice highlights dilemmas inherent to architectural design in a broader sense, anticipating issues from the professional field.

The impact of the pedagogical experience reported here has been observed as the workshop content begins to inform other student work, including projects, technology areas, and recent term paper topics. This demonstrates the relevance of the subject and its insertion in other contexts, reinforcing learning and improving the education of students, as evidenced by some testimonies from students of the discipline:

> The course [...] provided a very significant lesson. The methodology adopted, which included lectures, theoretical content on the projects, field trips, and a practical workshop based on the constructive logic of João Filgueiras Lima (Lelé), proved to be well-structured and fundamental for a broader, more consistent understanding of the subject, contributing to knowledge appropriation. Lelé's principles, especially those related to human-scale, site-adjusted prefabrication in construction and the well-being of workers, constitute valuable lessons I will certainly carry with me beyond graduation. (Student 1)

> The knowledge obtained in the course directly influenced my future design choices, as in my final coursework, where I studied and applied prefabrication, incorporating bioclimatic strategies primarily through the use of sheds. (Student 2)

> The subject [...] was a milestone in the course, providing a deeper understanding of modularity and how to work with this design

> logic, as demonstrated by the architect we studied and that we redesigned. This exercise gained even greater significance because it was conducted in familiar terrain under different implementation conditions than those in the study. (Student 3)

The understanding of the analyzed buildings is evident in several aspects of the projects presented, including the use of modulation and constructive elements, the implementation (internal courtyards, covered passageways), the definition of flows, and the distribution of the rooms. In addition to understanding architecture, there is also learning about design representations, since some groups prepared isometric perspectives with assembly layouts similar to the drawings produced by Lelé, which represented not only the building but also the construction strategies adopted.

In subsequent workshop projects, as well as in final course work, issues related to prefabrication and industrialization of construction began to be developed by the graduates, who seek to meet, in their projects, aspects such as resource savings, lightness of components, constructive flexibility, qualification of means of production and working conditions, in addition to agility of execution, in order to respond to urgent social demands. Despite being academic projects, these interests fuel debate about the paths of architecture amid global-scale changes.

The workshop reported here aimed to expand students' project experiences to support their future practices. Taking up the idea of Paulo Mendes da Rocha (Wisnik, 2012), according to which, contrary to any notion of stimulating creativity, an architect can only do what they effectively know, it is reinforced that it is up to teachers to offer students learning experiences based on praxis, guided by the dissection and analysis of architectural works, by the verification of hypotheses and by the propositional character.

CONTRIBUTIONS OF THE AUTHORS CRediT

Conceptualization, E. W.; Data Curation, E.W. & F. F.; Formal analysis E.W. & F. F.; Acquisition of funding; Research, E.W. & F. F.; Methodology, E.W. & F. F.; Project Management, E.W.; Resources, E.W. & F. F.; Software; Supervision, E.W. & F. F.; Validation, E.W. & F. F.; Visualization, E.W. & F. F.; Writing – original draft, E.W. & F. F.; Writing – review and editing, E.W. & F. F.

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AS / Vol 43 / Nº 68 / 2025
ISSN Impresa 0716-2677
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