Proyecto arquitectónico y urbano
Projeto arquitetônico e urbano
Architectural and urban project

Project research as a didactic strategy in the Architectural Design Workshop Project

La investigación proyectual como estrategia didáctica en el proyecto del Taller de Diseño Arquitectónico

César Fortunato Martínez-Vitor
Universidad Nacional del Centro del Perú. Huancayo (Perú)
Faculty of Architecture

Arquitecto, Universidad Nacional del Centro del Perú. Huancayo, Junín (Perú).

Magister Scientiae en Gestión Ambiental y Desarrollo Sostenible, Universidad Nacional del Centro del Perú. Huancayo, Junín (Perú)

Doctor en Medio Ambiente y Desarrollo Sostenible, Universidad Nacional Federico Villareal. Lima (Perú).

https://scholar.google.es/citations?user=Jdfa9_UAAAAJ&hl=es
orcid.org/0000-0001-7159-7973
cesar_vitor@hotmail.com

Abstract

In the search for better didactic strategies in the teaching-learning process of the architecture student, the application of project research, as a didactic strategy, positively influenced the project of the Architectural Design Workshop of the 10th semester 2017-1 at the *Universidad Nacional del Centro del Perú*, achieved through explanatory, quasi-experimental research. Methods of experimental planning were employed, and for the evaluation of learning by competencies, the analytical rubric was used. The corresponding analysis was made through inferential statistics of the medians of two paired populations, before and after, using the Wilcoxon non-parametric hypothesis test. The results indicate that prior knowledge on project research was not consistent in unit 1 (entry and adaptation stage), while in the follow-up and ending stage there are significant positive differences in the evaluation of units 1 and 3, and 2 and 3. The above shows that the application of project research has been set in the procedures of the Architectural Design Workshop, and it can be concluded that the application of project research, as a didactic strategy, properly exercised, is a relevant part in the teaching-learning process of the architecture student.

Keywords: architecture education; creativity; experimental schools; professional teaching; vocational colleges

Resumen

En la búsqueda de mejores estrategias didácticas en la enseñanza- aprendizaje del estudiante de arquitectura, la aplicación de la investigación proyectual como estrategia didáctica influyó positivamente en el proyecto del Taller de Diseño Arquitectónico del 10 semestre 2017-1 de la Universidad Nacional del Centro del Perú, logrado a través de la investigación explicativa, cuasi experimental. Se emplearon métodos del planeamiento experimental, y para la evaluación del aprendizaje por competencias, se utilizó la rúbrica analítica. El análisis correspondiente se hizo mediante la estadística inferencial de las medianas de dos poblaciones apareadas del antes y el después, mediante la prueba de hipótesis no paramétrica de Wilcoxon. Los resultados indican que los conocimientos previos sobre investigación proyectual no fueron consistentes en la unidad 1 (etapa de entrada y adecuación), mientras que en la etapa de seguimiento y término sí existen diferencias significativas positivas en la evaluación de las unidades 1 y 3, y 2 y 3. Lo anterior demuestra que la aplicación de la investigación proyectual se ha fijado en los procedimientos del Taller de Diseño Arquitectónico, y cabe concluir que, ejercitada adecuadamente, la aplicación de la investigación proyectual como estrategia didáctica es parte relevante de la enseñanza-aprendizaje del estudiante de arquitectura.

Palabras clave: creatividad; enseñanza en la arquitectura; enseñanza profesional; escuela experimental; escuela profesional

Introduction

This article is submitted as the result of the final Master thesis titled *Project Investigation as a Didactic Strategy in the Architectural Design Workshop*, in line with research on Pedagogical Methods, at the Faculty of Architecture of *Universidad Nacional del Centro Perú*.

Research in higher education is quite rich as regards to knowledge, understanding, and language use as well as in reference to its scientific focus to solve its problems. Presently, all scientific disciplines related to professional specializations – above all the activity focused on higher education – carry out their research in order to create their own language and their own scientific focus, as it takes place in the architect's education. As part of the solution to the architect's learning, Project Research (PR) is proposed as a didactic strategy in the Architectural Design Workshop Project.

In the architect's education workshop there are two phases: the first is *information*, and the second, *decision*. They are resolved according to the teacher's methodological focuses, which take up one or more of the due processes: 1) deductive, 2) inductive, or 3) abductive. Regardless of which process is chosen, both phases demand a series of actions with a specific aim, defined as *strategy*. The strategy in this research is based on postulates and theoretical and pedagogical bases of Ferreiro's constructivism (2007) which pointed out, at the same time, the strategies for the constructivist paradigm.

To develop the project experience, as applied to the researched workshop, the abductive method was chosen, which is carried out simultaneously in both phases. That is why project research is, simultaneously, architectural information and solution that evolves permanently from conjecture to experienced conjecture. In order to bring in problem issues to the research, the information phase is widely taken into consideration as project research.

Project research is a didactic strategy in the education of the architecture student, who does not gain knowledge in an efficacious way due to various factors that influence the teaching-learning process and the way to project; this is reflected in recurrent architectural projects lacking innovative proposals, and which are submitted by architecture faculty students around the world and, especially, in the Latin American environment.

This strategy is a relevant procedure being implemented in the academic environs of the architect's education, and which is evidenced in Latin America, with Sarquis (2007); in Argentina, with the work on project research developed in the book *Itinerarios del projecto* [Project Itineraries] by Jaime Correa (2003); in Colombia, with the research work titled *Investigación y proyecto arquitectónico* [Research and Architectural Project]; and in Mexico, with Tappan's work and his research work titled *La investigación proyectual: una propuesta que vincula docencia e investigación* [Project Research: A Proposal Binding Teaching and Research], among others and which, in light of the results of our research, increase and consolidate this project strategy.

In spite of the above, there are diverse theories, methods, and techniques that focus on project research as a pedagogical activity: the architectural project *Aprender investigando* [Learning by Research]; project research in architecture; project architecture and project research; the pedagogy of the architecture learning workshop; learning to project through the analysis of project decisions; learning tools applied by architecture schools; strategy as of the construction of a project research; and others.

To solve project research as a didactic strategy a planned system was devised, a program that became the experimental plan with the before-method and the after-development of project research as a set of graded activities that allowed the 2017-1 tenth-semester students at the architecture faculty of *Universidad Nacional del Centro Perú* to increase their project level.

In this sense, the research provided an answer to the question: *How does the application of project research as a didactic strategy influence the Architectural Design Workshop project?*

The question posed, in turn, identifies, as the objective of the work to determine how the application of project research as a didactic strategy influences the Architectural Design Workshop project.

The development of the experimental plan in all its parts was useful to demonstrate the formulated hypothesis: The application of project research as a didactic strategy significantly influences the Architectural Design Workshop project.

The sample population consisted of 13 tenth-semester students from section A 2017-1 of the Faculty of Architecture of the *Universidad Nacional del Centro Perú*.

Among the basic contextualized references there is Jiménez (2003) with his article *"Investigación y proyecto arquitectónico"* [Research and architectural project], whose main purpose was "to specify the interaction between research and practical-reflective processes that overcome instrumental actions to solve the tensions between the objective doing and the construction of subjectivity…" (p.13) under a qualitative approach with a descriptive research design. The instrument was an analysis matrix.

Tappan's work (2012) was also taken into account in the project research, a proposal that binds teaching and research, and thanks to this purpose three key aspects can be introduced: 1) the interdisciplinary nature of a problem, 2) the creative act in the discovery and innovation phase, and 3) drafting them up within the creative process to then be able to apply them in teaching and research within a contextual, methodological and theoretical framework, and whose research design is descriptive. On the other hand, there is Pina (2004), who talks, in the architecture project, about scientific rigorousness as a poetic instrument (doctoral thesis).

The *Universidad Politécnica de Madrid*, provides the essential bases of the logical process of projection, with a qualitative-quantitative approach, whose research design is descriptive-correlational. In his project research in architecture, as studied in the Master graduation projects of architectural design at the Faculty of Architecture and Urbanism of *Universidad Central de Venezuela* (doctoral thesis), Zamora (2012) set out as a design method and strategy the theoretical bases on project research under the qualitative-quantitative approach; as a tool, he used a cartographic structure.

The contribution of the research comes across, first and foremost, from the basic theories for project research in architectural designs that tend to innovation in accordance to the development of science and society – which, at the same time, allowed to describe, explain, understand, interpret, test and attempt the transformation of the reality habitat.

Firstly, there are the contributions of project research as a way to develop knowledge in architecture, as proposed by Sarquis (2007) in his two books on epistemological fiction and fiction of the real. As project itineraries, they were of outmost importance since they allowed to scrutinize the prolegomena of project research. Sarquis proposes architecture as a consequence of social practice, disciplinary knowledge, the habitat members, the existing, the examples, the traces, and the analysis of poietic products.

On the other hand, Muntañola (2011) proposes as analytical reflections the projectual imagination, the projectual logic and the projectual architecture.

Another reference that reinforces this research is that of Fernandez (2013), who developed the concepts on: the theory gap; what to research, how and for what; how to elaborate a research text; and the products and perspectives of eco-projects. As a contribution to project research, the same author proposes the existence of some *project knowledge*; he goes over his themes as of a general theory of habitat and project research as the bases for scientific research, and he lays down an agenda of topics for project research.

For this research, Ferreiro's postulates and his theoretical-pedagogical bases on constructivism (2007, p.27) were adopted, as they pointed out his contribution to the following constructivist paradigm:

- Project research as a didactic strategy for the Architectural Design Workshop is cognizible.

- Any architecture student and all teachers are able to know project research as a didactic strategy by the Architectural Design Workshop in its successive approximations.

- The knowledge-acquiring process of project research as a didactic strategy by the Architectural Design Workshop is an active one, and it is characterized by the function of the consciousness and feelings of the subject who is learning.

- Knowledge acquired through project research as a didactic strategy of the Architectural Design Workshop is not innate nor is it provided a *priori*. It is build up by architecture teachers and students. They appropriate it through activity and language.

- The architecture student who learns is not the only one responsible for the process of knowledge construction: the environment is a condition for its development.

As a basis for the architecture project, from Vitruvius (2002) and his ten books on architecture up to the contemporary ones were taken into account: Le Corbusier (1959), and his *Mensaje a los estudiantes de arquitectura* [Message to Architecture Students]; Alexander (1976), and his *Ensayo sobre la síntesis de la forma* [Essay on the synthesis of form]; Quaroni (1980), with *Proyectar un edificio: ocho lecciones de arquitectura* [Projecting a building: eight architecture lessons]; Purini (1984), with *La arquitectura didáctica* [Didactic Architecture]; Munari (1990), with *Diseño y comunicación visual* [Design and Visual Communication]; Muñoz (2016), with *El proyecto de arquitectura, concepto proceso y representación* [The architecture project, concept process, and representation]; and the sequence of theoretical contributions up to the present.

From the Latin American environs, contributions by Villagrán (1988) with his theory of architecture and, from the Peruvian context, Ludeña (1997), and *La arquitectura en el Perú del siglo XX.* [Architecture in XX Century Perú] were also taken into account.

As regards the validity of studies and state of the art, there is a wide range of works, out of which, in their function of project research variable as a didactic strategy, the following articles are quoted: Bhooshan's (2017) "Pensamiento de diseňo paramétrico: un estudio de investigación arquitectónica integrada en la práctica" [Parametric design thought: a study of architectural research integrated into the practice]; Xue and Desmet´s (2019) "Investigación introspectiva para la investigación de diseño basada en la experiencia" [Introspective research for design research as based on experience]; and from Khodeir's (2018) "Métodos de aprendizaje combinado como un enfoque para enseñar la gestión de proyectos a estudiantes de arquitectura" [Combined learning methods as an approach to teach project management to architecture students].

For the variable The Architectural Design Workshop Project, AboWardah (2019) is quoted: "Cerrar la brecha entre las fases de investigación y diseño esquemático en la enseñanza de proyectos de graduación arquitectónica" [To close the gap between the research phases and schematic design in the teaching of architectural graduation projects]. And by Ghonim and Eweda (2019), "Perspectivas de los instructores sobre la pedagogía de los proyectos de graduación arquitectónica: un estudio cualitativo" [Instructors' perspectives on the pedagogy of architectural graduation projects: a qualitative study].

The main point of project research as a didactic strategy is not only prevailing but, in addition, it keeps finding new applications based on novel theories or IT technologies within the problem-besieged learning system of the Architectural Design Workshop.

Methodology

The quasi experimental study took place with the participation of students from the Design Workshop 10, Section A, of the Architecture Faculty of *Universidad Nacional del Centro Perú*, from the 2017-1, the tenth final semester of their career.

At the start of the workshop the Visual-Auditory-Kinesthetic (VAK) survey-questionnaire was applied; it is a neurolinguistics programming test that determined the type of learning style students
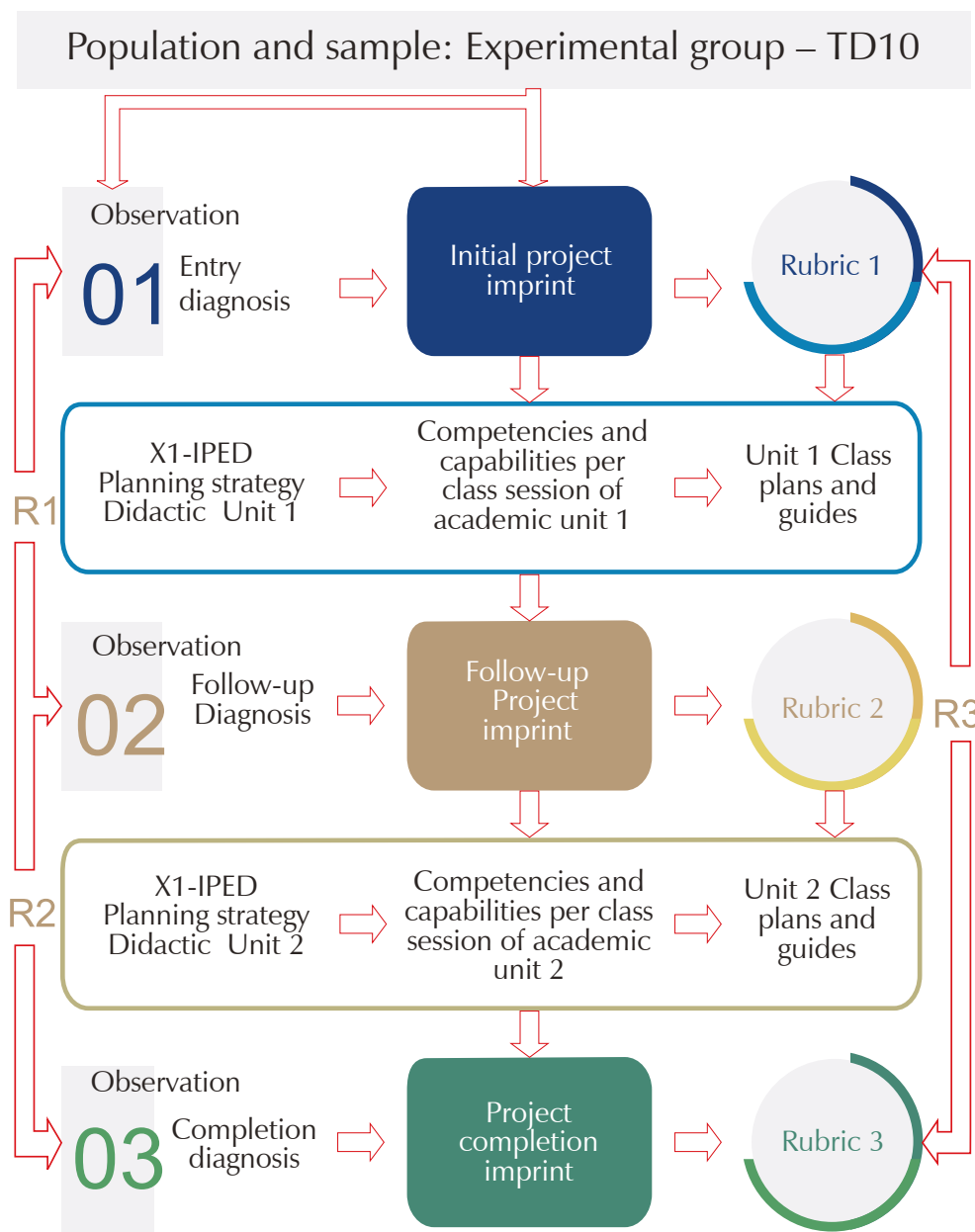

Figure 1: Methodological structure and experimental procedure; the design is made into a graphic of a single group G1: O1 X O2 X O3 with their results 1, 2 and 3.
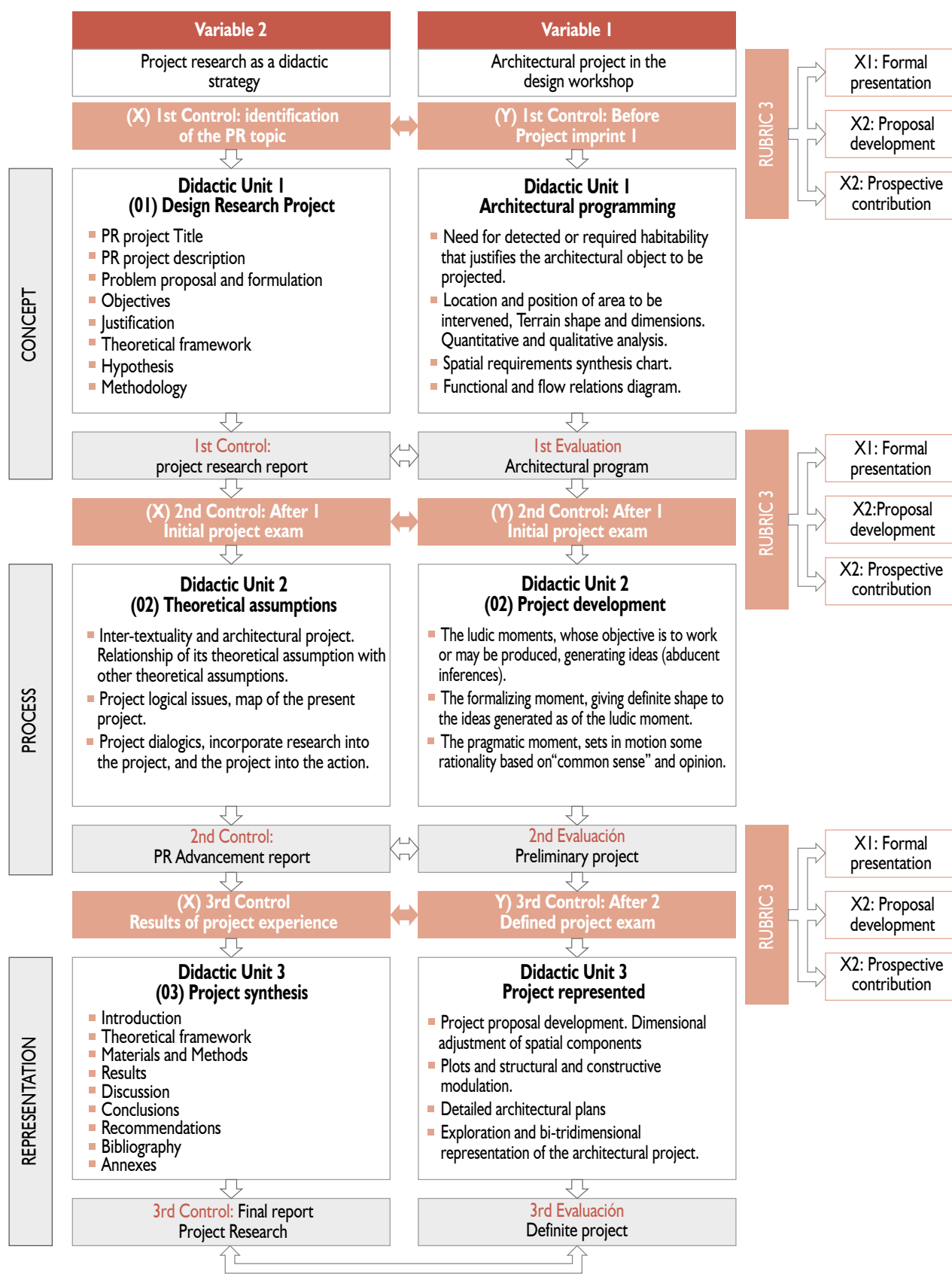Source: Sierra (2001) and Hernández et al. (2014)

Variable 2	Variable 1		
Project research as a didactic strategy	Architectural project in the design workshop	**RUBRIC 3**	X1: Formal presentation
(X) 1st Control: identification of the PR topic	**(Y) 1st Control: Before Project imprint 1**		X2: Proposal development
			X2: Prospective contribution

CONCEPT

Didactic Unit 1 (01) Design Research Project
- PR project Title
- PR project description
- Problem proposal and formulation
- Objectives
- Justification
- Theoretical framework
- Hypothesis
- Methodology

Didactic Unit 1 Architectural programming
- Need for detected or required habitability that justifies the architectural object to be projected.
- Location and position of area to be intervened, Terrain shape and dimensions. Quantitative and qualitative analysis.
- Spatial requirements synthesis chart.
- Functional and flow relations diagram.

1st Control: project research report	1st Evaluation Architectural program		
(X) 2nd Control: After 1 Initial project exam	**(Y) 2nd Control: After 1 Initial project exam**	**RUBRIC 3**	X1: Formal presentation
			X2:Proposal development
			X2: Prospective contribution

PROCESS

Didactic Unit 2 (02) Theoretical assumptions
- Inter-textuality and architectural project. Relationship of its theoretical assumption with other theoretical assumptions.
- Project logical issues, map of the present project.
- Project dialogics, incorporate research into the project, and the project into the action.

Didactic Unit 2 (02) Project development
- The ludic moments, whose objective is to work or may be produced, generating ideas (abducent inferences).
- The formalizing moment, giving definite shape to the ideas generated as of the ludic moment.
- The pragmatic moment, sets in motion some rationality based on "common sense" and opinion.

2nd Control: PR Advancement report	2nd Evaluación Preliminary project		
(X) 3rd Control Results of project experience	**Y) 3rd Control: After 2 Defined project exam**	**RUBRIC 3**	X1: Formal presentation
			X2: Proposal development
			X2: Prospective contribution

REPRESENTATION

Didactic Unit 3 (03) Project synthesis
- Introduction
- Theoretical framework
- Materials and Methods
- Results
- Discussion
- Conclusions
- Recommendations
- Bibliography
- Annexes

Didactic Unit 3 Project represented
- Project proposal development. Dimensional adjustment of spatial components
- Plots and structural and constructive modulation.
- Detailed architectural plans
- Exploration and bi-tridimensional representation of the architectural project.

3rd Control: Final report Project Research	3rd Evaluación Definite project

Ⓐ Figure 2. Planning, execution, control and evaluation of experimental program.

Source: Author´s own elaboration (2017). CC BY-NC

had, such as visual, 56 %; auditory, 17 %; and kinesthetic, 29 %. It was a heterogeneous population with their own learning styles and architectural projection, which was later taken into account in the implementation of the research methodology.

The type of research, taking into account its purpose, was characterized as *applied*; due to its temporary reach, as sectional; by its depth, as explanatory, by its amplitude, as *micro-sociological*; by its sources, as *mixed*; by its character, as *quantitative*; and by its nature, as *quasi-experimental*. These characteristics were taken from Sierra (2001), and Hernández and Mendoza (2018).

In Figure 1 can be seen the methodological structure and the experimental procedure of independent variables X1 and X2, whose reactive mode is the planning strategy and implementation in didactic units 1 and 2.

The experimental planning method with a strategy regarding quality, productivity and competitiveness was structured in a systemic manner using the strategy of quality, productivity, and competitiveness proposed by Deming.

Figure 2 shows the planning of the experimental structure program in the syllabus, and its execution, control and evaluation process, which will be reflected in the results.

Figure 3. Learning evaluation of the architectural project.

Source: author´s own elaboration (2017), based on Mezarina et al. (2016). CC BY-NC

Figure 4. Conjunction of knowledge

Source: Sarquis (2014, p. 16).
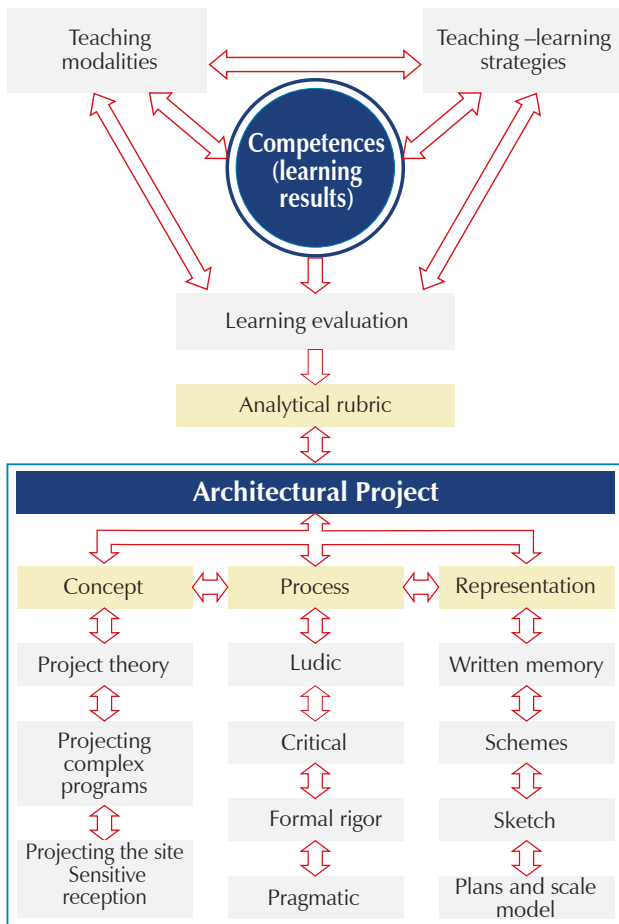
Note: In the project imprint this process occurs in an instantaneous manner
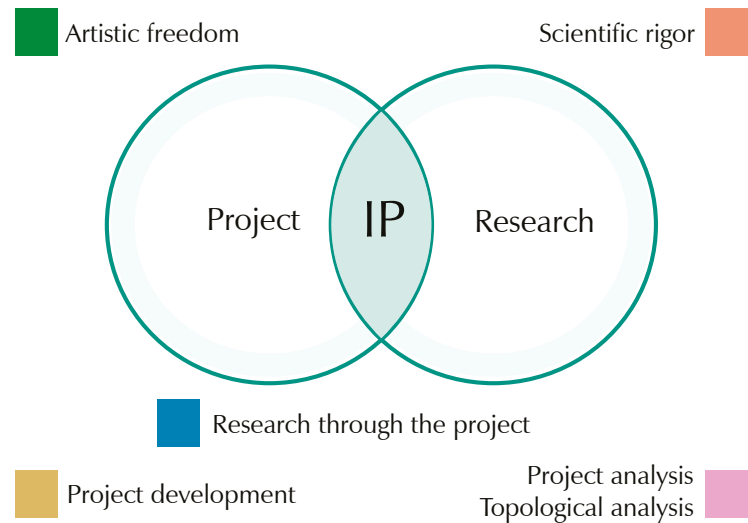
Performances to be evaluated		Rating Scale			
Performances	Indicators	Very good (4)	Good (3)	Average (2)	Deficient (1)
Performance 1	Activity	Hierarchy-detailed Inclusive 100 % - 81 %)	Hierarchy-detailed Inclusive (80 %-61 %)	Hierarchy-detailed Inclusive (60 %-41 %)	Hierarchy-detailed Inclusive (40 %-0 %)
	Process				
	Impact				
Performance 2	Activity	Hierarchy-detailed Inclusive 100 % - 81 %)	Hierarchy-detailed Inclusive (80 %-61 %)	Hierarchy-detailed Inclusive (60 %-41 %)	Hierarchy-detailed Inclusive (40 %-0 %)
	Process				
	Impact				
Performance 3	Activity	Hierarchy-detailed Inclusive 100 % - 81 %)	Hierarchy-detailed Inclusive (80 %-61 %)	Hierarchy-detailed Inclusive (60 %-41 %)	Hierarchy-detailed Inclusive (40 %-0 %)
	Process				
	Impact				
Indicators criteria		Performance level descriptors			

Evaluation of learning by competences as applied to the experimental program is represented in Figure 3. At the start of each one of the three academic units of the architectural project workshop, the entrance test was applied as a project imprinting, assessed as a sudden, short, and fast architectural solution. It is a synthesis moment, as represented in architectural drawings and a physical scale model that depicts the student's capability and aptitude to solve architectural problems in a single session. A solution or an architectural proposal for an architectural program in a given terrain is materialized on the basis of the project research theme (generating idea) that gives emphasis to the proposal whose solution solves a habitat problem posed.

In Figure 4, in the conjunction of knowledge, project research is shown as an intersection between program research of the architectural project and the solution of the architectural object. The said process is assumed as of the general program up to the time to make decisions as given by the design imprint.

The analytical rubric instrument is the one measuring the application of the experimental program which, at the same time, was constructed according to the characteristics shown in Table 1.

The rubric for the architecture project evaluation was supported by research-action, characterized by its being practical, and which led to

Table 1. Base construction structure of the analytical rubric.

Source: Author´s own elaboration (2017). CC BY – NC

the improvement of the project trial, as participative and collaborative, when applied as self-evaluation, co-evaluation, and hetero-evaluation, as well as critical; this allowed to evaluate feedback as theory, methods, and techniques applied to the teaching-learning process in the Architectural Design Workshop.

Thus, the evaluation rubric is binding in relation to the evaluation of the processes in the Architectural Design Workshop Project, and it is the foundation for the results of the architectural project in the education process of the future architect.

The architectural project as a by-product of architectural design, presently continues evaluating in an arbitrary and intuitive manner since teachers do not count on consistent instruments to carry out that process. With this instrument, self-evaluation, co-evaluation, and hetero-evaluation are guaranteed.

Results

Practical experimentation with professional architects exercising teaching, and students, in their professional training as architects, was carried out as a learning proposal through project research as a didactic strategy for the Architectural Design Workshop. It was a mutual approach, involving both, teacher and student. It was deconstructed throughout the experimental process and reconstructed in the results into a rather complex system, full of details summarized in the outcomes obtained and in the contrasts that the theory and its advances allow us to detail.

The qualitative treatment of the data was obtained from the evaluation of the graphic material presented as empirical evidence of the results, as outlined in Figure 5

The graphic results of the entry diagnostic design imprint are presented in Figure 6, which also shows a great potential for formal design with very elementary and basic information of a training in design research.

Graphic results of the follow-up project imprint are shown in Figure 7, where project research application of the project theoretical conjecture can be observed, with a theoretical-conceptual management as applied to the main urban theme and its individual architectural projects.

Graphic results of the project completion imprint are shown in Figure 8, where the application of project research interacting with the urban project and its individual architectural projects can be seen, as reflected in their architectural part and the preliminary project.
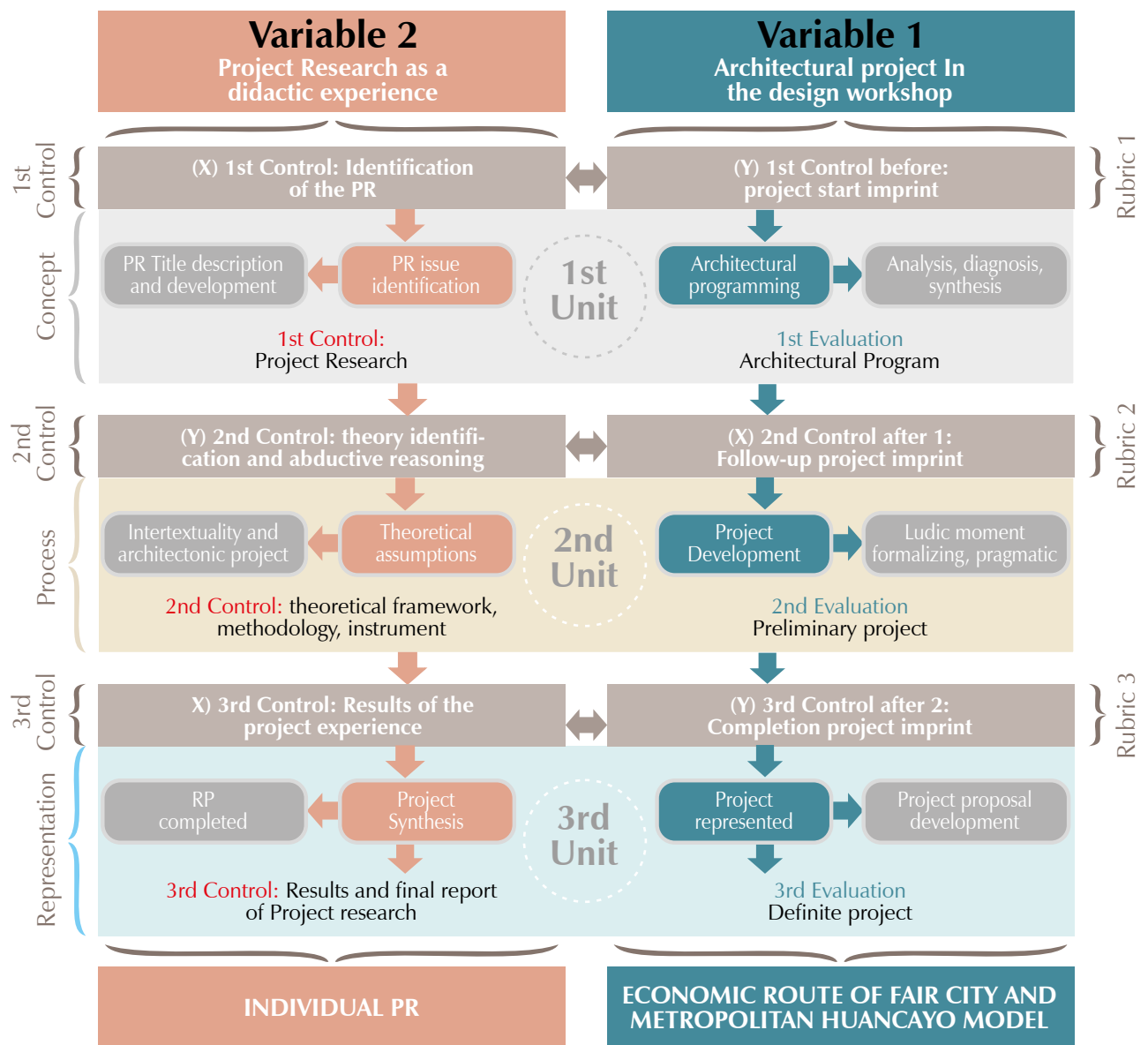
Figure 5.
Implementation of planning, execution, control, and evaluation of experimental program.

Variable 2
Project research as a didactic experience

Variable 1
Architectural project in the design workshop

1st Control

(X)1st Control: Identification of the PR issue

(Y) 1st Control before: Project start imprint

Rubric 1

Observation 1: Entry diagnosis

Initial Proposal
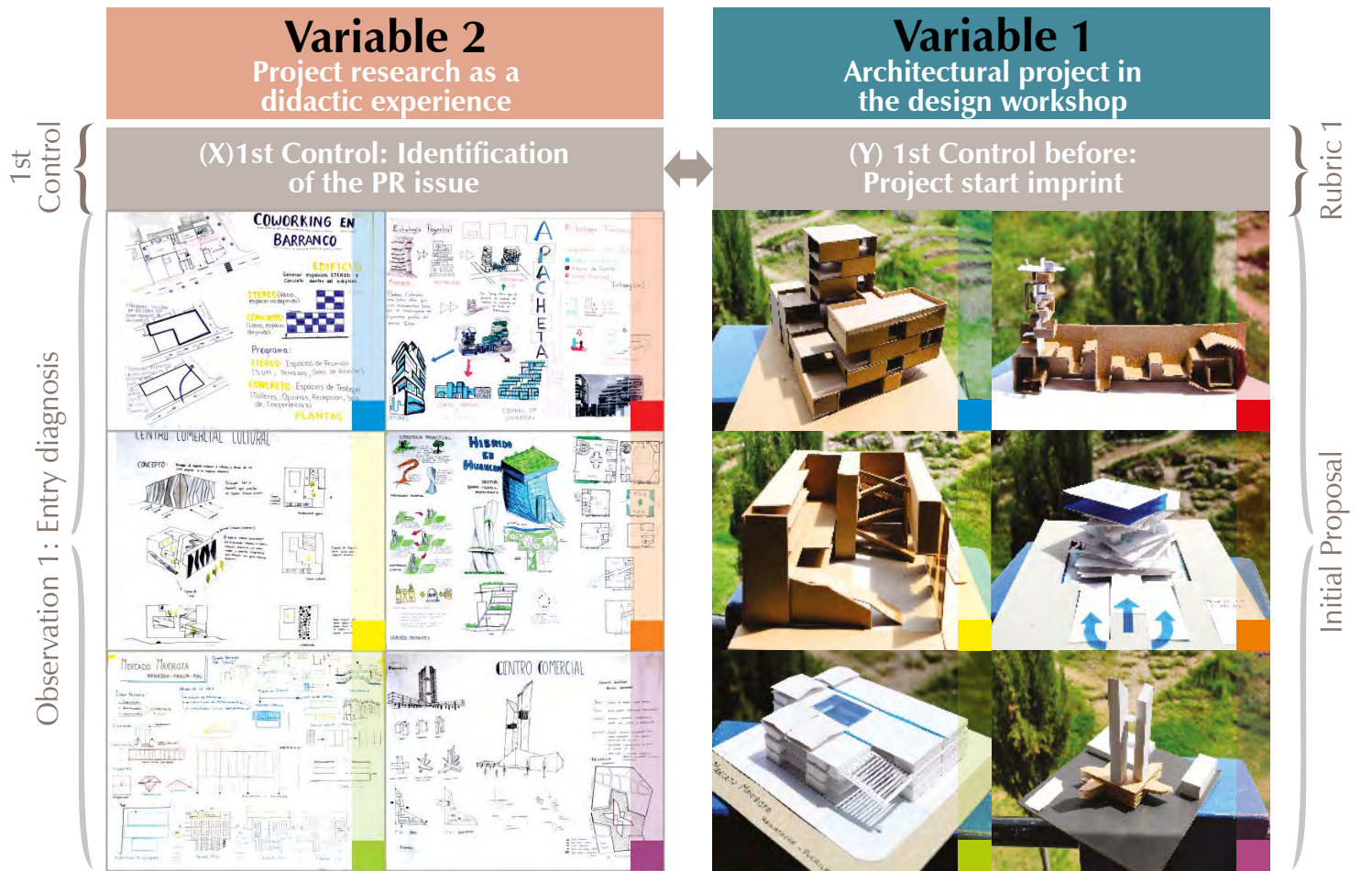
Ⓐ Figure 6. Project diagnosis start imprint.
Source: author´s own elaboration (2017). CC BY – NC

Variable 2
Project research as a didactic experience

Variable 1
Architectural project in the design workshop

2nd Control

(Y) 2nd Control after U1 PR Theoretical framework

(X) 2nd Control after U1: Defined projectual conjecture

Rúbric 2

Observation 2: Follow-up diagnosis

Basic response to theory and concepts

2nd Control
PR advancement report

2nd Evaluation
Preliminary project
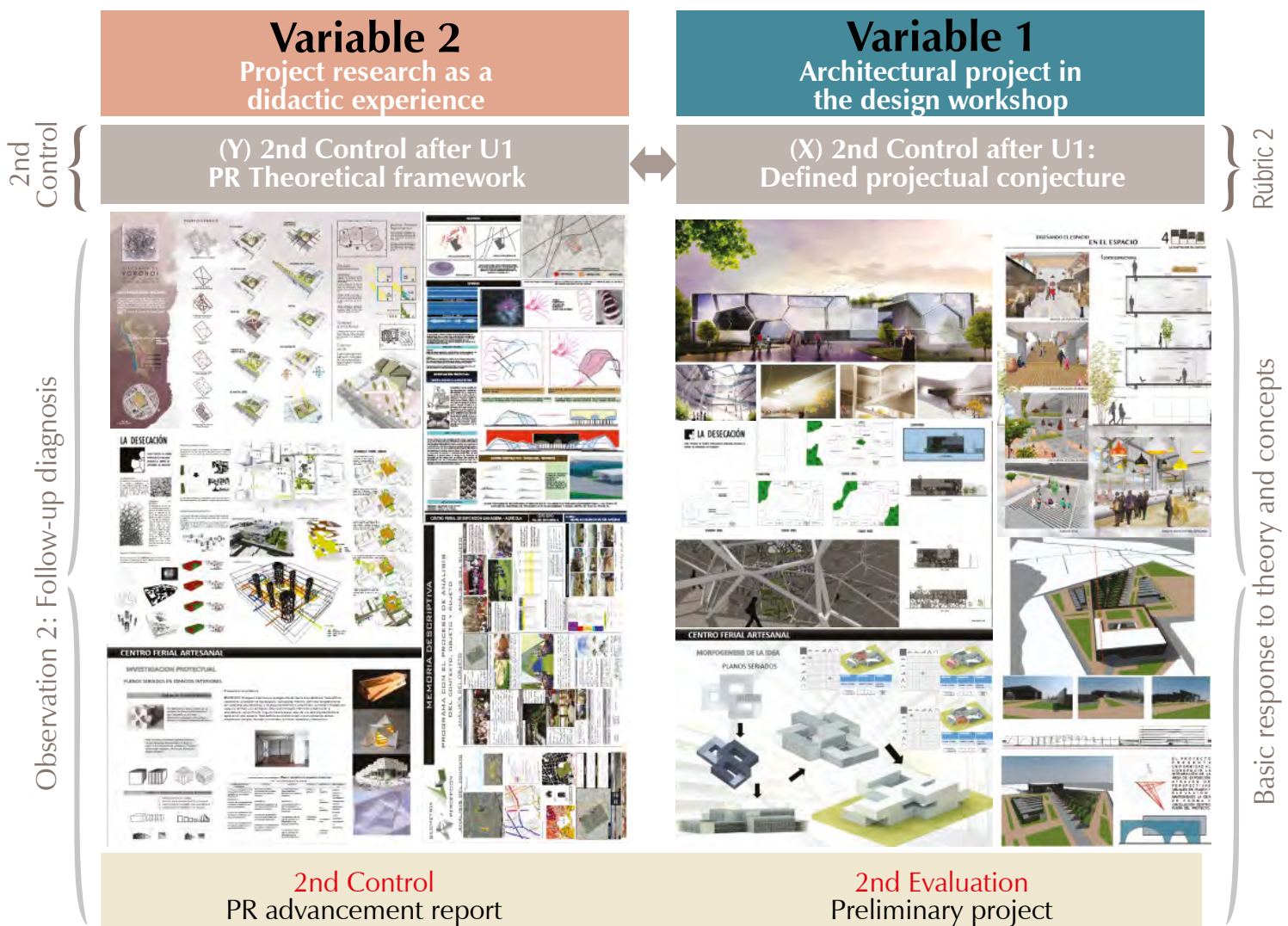
Ⓐ Figure 7. Project follow-up imprint
Source: author´s own elaboration (2017). CC BY-NC

Variable 2
Project research as a didactic experience

Variable 1
Architectural project in the design workshop

1st Control

(Y) 2nd Control after U2 application of PR methodology

(X) 2nd Control after U2: Architectural party

Rúbric 1

Observation 3: Completion diagnosis

Response to the application of RP methodology

1st Control
PR advancement report

1st Evaluation
Architectural party

 Figure 8. Project completion imprint.
Source: author´s own elaboration (2017). CC BY-NC

Variable 2
Project research as a didactic experience

Variable 1
Architectural project in the design workshop

3rd Control

X) 3rd Control after U3 Results of project research

(Y) 3rd Control after U3: Architectural party

Rúbric 3

Final result: Architectural project

PR final result + architectural project

3rd Control
PR final report

3rd Evaluation
Definite architectural project
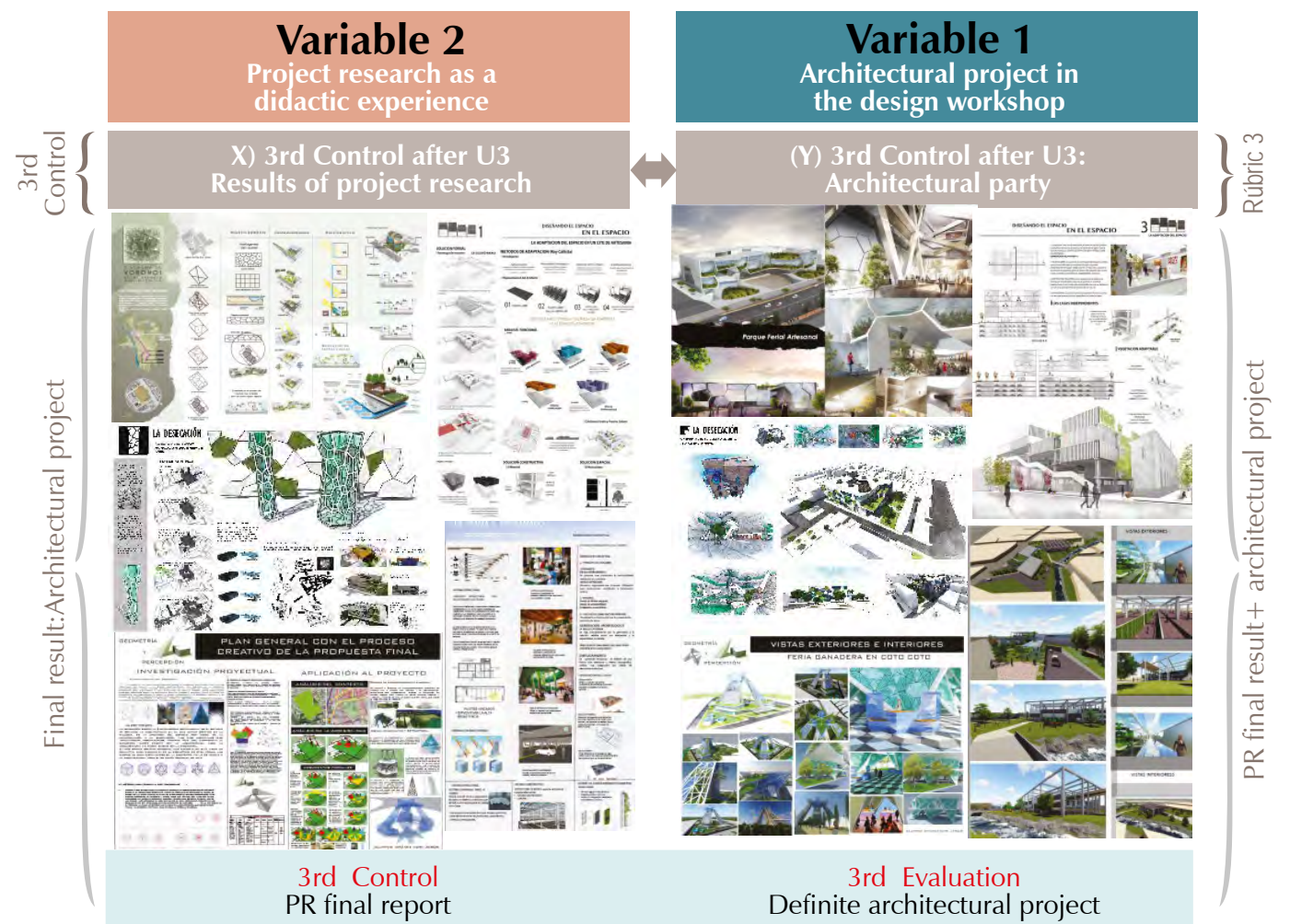
 Figure 9. Final architectural project.
Source: author´s own elaboration (2017). CC BY – NC

Kolmogorov-Smirnov			
	Statistic	**gl**	**Sig.**
Project imprint 1	0,192	13	0,200[*]
Project imprint 2	0,225	13	0,072
Project imprint 3	0,308	13	0,001

Ⓐ Table 2. General normality test.
Source: author's own elaboration (2017). CC BY-NC

Test statistics			
	Project imprints: 1-2	**Project imprints: 1-3**	**Project imprints: 2-3**
Z	-,861b	-2,439c	-3,071c
Asymptotic (bilateral)	0,389	0,015	0,002

Ⓐ Table 3. Tests statistics of Wilcoxon general test.
Source: author's own elaboration (2017). CC BY-NC

The graphic results of the final architectural project are shown in Figure 9, which shows the final results of the project research interacting with the urban project and their individual architectural projects, reflected in the final architectural project.

As a correlate of the empirical graphic evidence, the quantitative results of the evaluation rubrics are developed.

The quantitative treatment of the data was done using descriptive and inferential statistics, and the data were processed using Spss 24

At the beginning, the overall normality test based on the theoretical rule for statistic decision was used:

Theoretical rule:

- If the significance value is > 0,05, it is normal.
- If the significance value is < 0,05, it is not normal.

From Table 2 the following normal distribution data may be obtained:

- Project imprint 1: 0,200> 0,05 is normal.
- Project imprint 2: 0,072 > 0,05 is normal.
- Project imprint 3: 0,001 < 0,05 is not normal.

Statistical decision: because of the above, when no normality was shown in the whole of the evaluations, Wilcoxon's non-parametric test was applied.

Once the normality test for verifying the specific hypotheses was performed, it was concluded that if there was one or more non-normality data, the Wilcoxon non-parametric test should be used.

Once the preliminary results were obtained, and having established Wilcoxon's non-parametric test as the test statistic, the general hypothesis test was

Theoretical rule:

- H_O: There is no significant difference between initial assessment i and initial assessment j.
- H_1: There is a significant difference between initial assessment i and initial assessment j.

Wilcoxon´s test shows that in the first case Ho ($p1 = 0,389 > 0,05$) is not rejected, and in the second and third cases, Ho ($p2 = 0,015 < 0,05$; $p3 = 0,002 < 0,05$) is rejected.

Ⓐ Figure 10. Variable project imprint Averages.
Source: author´s own elaboration (2017) CC BY-NC

Test statistics			
	Formal Presentation: 1-2	**Formal Presentation: 1-3**	**Formal Presentation: 2-3**
Z	-1,011	-2,453	-2,781
Asymptotic (bilateral)	0,312	0,014	0,005

◁ Table 4. Test statistics of Wilcoxon test on the formal dimension presentation.

Source: author´s own elaboration (2017). CC BY-NC
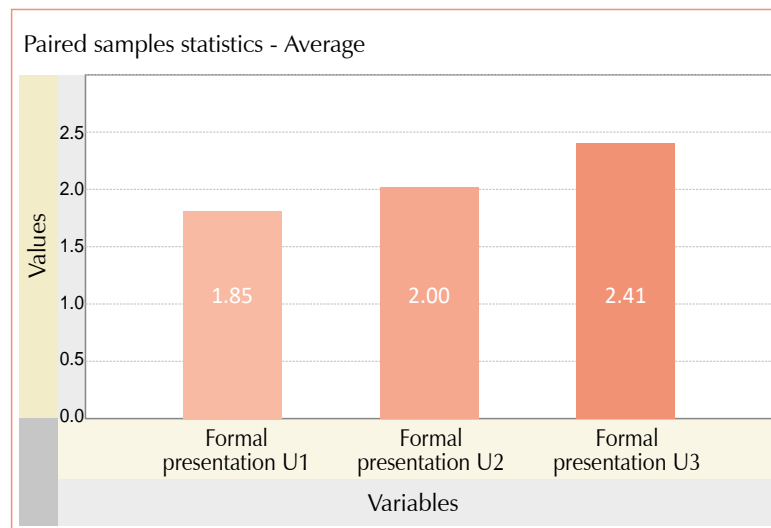
Ⓐ Figure 11. Averages of the formal dimension presentation.
Source: author´s own elaboration (2017). CC BY-NC

Proyecto arquitectónico y urbano

Architectural and urban project   La investigación proyectual como estrategia didáctica en el proyecto del Taller de Diseño Arquitectónico

Test statistics			
	Development of proposal: 1-2	Development of proposal: 1-3	Development of proposal: 2-3
Z	-1,059b	-1,809c	-2,739c
Asymptotic (bilateral)	0,289	0,070	0,006

Table 5. Wilcoxon test statistics of the development dimension of the proposal.
Source: author´s own elaboration (2017). CC BY-NC

Paired samples statistics - Average
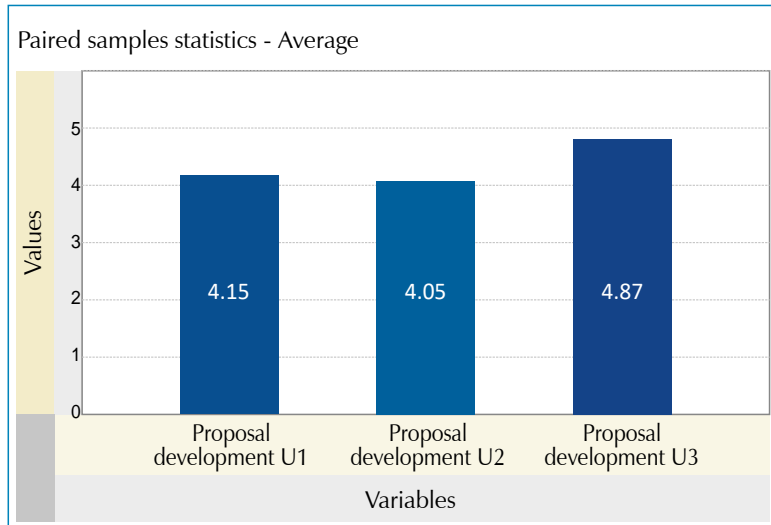
A Figure 12. Averages of the development dimension presentation.
Source: author´s own elaboration (2017). CC BY-NC

Test statistics			
	Prospective contribution: 1-2	Prospective contribution: 1-3	Prospective contribution: 2-3
Z	-,451b	-1,875c	-2,607c
Asymptotic (bilateral)	0,652	0,061	0,009

Table 6. Wilcoxon test statistics of the prospective contribution dimension.
Source: author´s own elaboration (2017). CC BY-NC

Paired samples statistics - Average
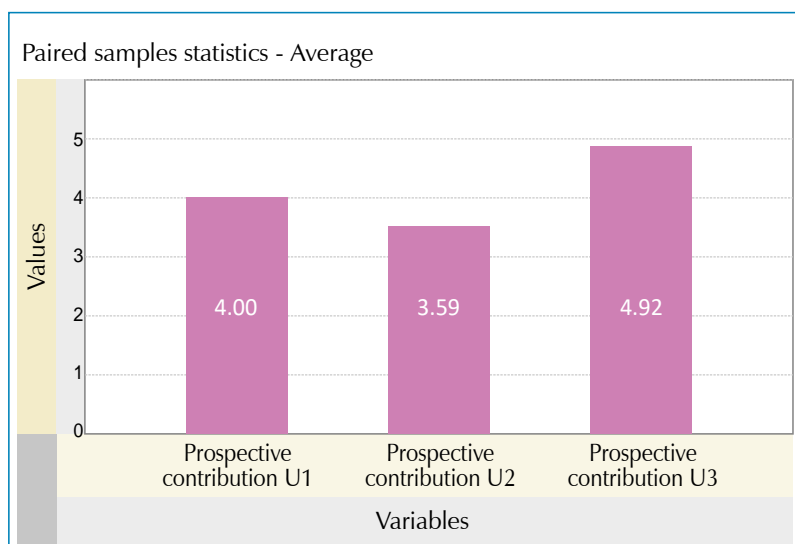
A Figure 13. Averages of the prospective contribution dimension.
Source: author´s own elaboration (2017). CC BY-NC

Statistical decision: from Table 3 and Figure 10 it may be deducted that the results of project imprint 3 are the ones showing a higher average, which points out that the application of project research has significantly influenced procedures and architectural project as developed by the Architectural Design Workshop.

Testing of hypotheses specific to the formal presentation dimension.

Theoretical rule:

- H_o: There is no significant difference between the results of the formal presentation of Unit i and the results of the formal presentation of Unit j.
- H_1: There is a significant difference between the results of the formal presentation of Unit i and the results of the formal presentation of Unit j.

Wilcoxon´s test shows that in the first case Ho ($p1 = 0,312 > 0,05$) is not rejected, and in the second and third, Ho ($p2 = 0,014 < 0,05$; $p3 = 0,005 < 0,05$) is rejected.

Statistical decision: From table 4 and Figure 11 it is deduced that the formal dimension presentation of Unit 3 project imprint is the one that shows a higher average which, at the same time, indicates that the application of project research has significantly influenced the procedure and architectural project as developed by the Architectural Design Workshop.

Specific hypothesis on the development dimension of the proposal.

Theoretical rule:

- H_o: There is no significant difference between the results of the development of the unit i proposal and the development of the unit j proposal.
- H_1: There is a significant difference between the results of the development of the unit i proposal and the development of the unit j proposal.

Wilcoxon's test shows that neither in the first nor in the second case Ho ($p1 = 0,652 > 0,05$; $p2 = 0,061 > 0,05$) are rejected, and in the third Ho; $p3 = 0,009 < 0,05$) is rejected.

Statistical decision: From Table 5 and Figure 12, it is deduced that the development dimension of the proposal of project imprint for unit 3 is the one that shows a higher average which, at the same time, indicates that the application of Project Research has significantly influenced the procedures and architectural project as developed by the Architectural Design Workshop.

Specific hypothesis of the prospective contribution dimension.

Theoretical rule:

- H_o: There is no significant difference between the results of prospective contribution i and the results of prospective contribution j.

- H_1: There is a significant difference between the results of the prospective contribution *i* and the results of prospective contribution *j*.

Wilcoxon's test shows that neither in the first nor in the second case Ho ($p1 = 0,289 > 0,05$; $p2 = 0,070 > 0,05$) are rejected, and in the third Ho; $p3 = 0,006 < 0,05$) it is rejected.

Statistical decision: From Table 6 and Figure 13 it can be deducted that the results of the prospective contribution of unit 3 is the simple with a higher average, which indicates that the application of Project Research has significantly influenced the procedures and the architectural project as developed in the Architectural Design Workshop.

Discussion

The design workshop project and the teaching-learning process have gone hand-in-hand with the development of the research, where -in each part of the process- it was necessary to review the theoretical postulates and background upon which research is based, resolving concrete situations through constant feedback that generated a mutual interactive learning dynamics between the teacher and the student. Results are contrasted with theory and background supporting them as regards the systematized points of the experience gained in the project research work as a didactic strategy.

Contributions by project research as proposed by Sarquis (2007) in his books *Ficción epistemológica y Ficción de lo real, itinerarios del proyecto* [Epistemological Fiction and Fiction of the Real, Itineraries of the Project], which are the outcome of his doctoral thesis and served as the basis for his application to the Master's and Doctorate degree of the same name at *Universidad de Buenos Aires* (UBA); in our case were introduced as undergraduate experience, and to do so was a wholesome challenge. The results of Project Research as a didactic strategy in the Architectural Design Workshop project have been significant and point out that it is a valid strategy to be applied in undergraduate studies.

When in his book *El proyecto de arquitectónico aprender investigando*, Jiménez (2006) demonstrates the importance that the project generates knowledge in the student, he does it from the point of view of expert judgment, unlike the present research, in which this is demonstrated by the evaluation of the production of the architectural projects worked on by the students, and thus validates the same hypothesis from an experimental work.

It is feasible to implement organizational theories and proposals in the experimental program inserted in the TD10 syllabus, as is the case with Deming's theory of quality, productivity and competitiveness (1989), in its four processes adapted to the developed program of planning, execution, control and evaluation, as of didactic optics and strategies.

In order to operate the variable Architectural Design Workshop Project, it was processed within Muñoz' theoretical framework (2016), and his book *El proyecto de arquitectura* [The Architecture Project]. He develops his proposal in two environs: 1) the professional practice, and 2) the architect's educational process. It is this second aspect the one taken as a basic reference, and it is corroborated for the drafting of the analytical rubric instrument, which evaluates the project start imprint, its follow up, and the completion of the research. His definitions and concepts on details of the architectural project become relevant within the evaluation tools of the analytical rubric and the results obtained.

For the development of the project it was necessary to take into account all the concurrent referents to the object of the research; therefore, the work of Martinez (2013) *The architectural project as a research problem* had as its main objective to propose the identification of methodological processes to develop the practice of architectural design, which is summarized in the architectural programming. His contribution was substantial in the preparation of the items of the *formal presentation* dimension of the analytical evaluation rubric.

The application of project research as a didactic strategy has significantly influenced the procedures and the architectural project developed in the Architectural Design Workshop, and it can be replicated for the training of architects in the various modalities of architectural workshops held in Latin America.

Conclusions

By detailing the application of the project imprint evaluated by the analytical rubric in its general results and in its three dimensions (formal presentation, proposal development, and prospective contribution), the following conclusions can be reached:

From the application of the three project imprints, at the start of each unit and the statistical analysis of the first and second one, the first and third one, the second and third one, the results proposed in the research project were obtained, which point out that the application of project research as a didactic strategy in the first unit does not manage to go beyond their prior knowledge. And for the second and third units, the adaptation stage has been surmounted, obtaining the final result, which has significantly influenced the procedures and the architectural project developed in the Architectural Design Workshop.

In the specific dimensions, similar to the general analysis, it is observed that for the *formal presentation* dimension the results of the project imprint at the start of each unit and of the statistical analysis of the first and second one, the first and the third one; the second and third show that in the first unit prior knowledge is not surpassed in the *formal presentation* dimension; and for the second and third units, the adaptation stage has been overcome as regards the application of project research as a didactic strategy.

In the *proposal development* dimension, results of the project imprint were compared at the start of each unit, and the statistical analysis shows that in the first and second unit their previous knowledge is not surpassed, and for the third

unit, the adaptation stage has been overcome regarding the application of project research as a didactic strategy.

In the *prospective contribution* dimension imprint results were compared at the beginning of each unit, and the statistical analysis of the first and second one, the first and the third one; the second and third one show that the application of project research as a didactic strategy in the first and second units does not manage to surpass the previous knowledge in the *prospective contribution* dimension, and for the third unit, the adaptation stage has been surmounted as to the application of project research as a didactic strategy.

References

AboWardah, E. S. (2019). Bridging the gap between research and schematic design phases in teaching architectural graduation projects. Frontiers of Architectural Research, 9(1), 82-105. https://doi.org/10.1016/j.foar.2019.04.005

Alexander, C. (1976). Ensayo sobre la síntesis de la forma (4a). Ediciones Infinito.

Bhooshan, S. (2017). Parametric design thinking: A case-study of practice-embedded architectural research. Design Studies, 52, 115-143. https://doi.org/10.1016/j.destud.2017.05.003

Deming, W. (1989). Calidad, productividad y competividad (versión es). Ed. Díaz de Santos.

Fernández, R. (2013). Inteligencia proyectual, un manual de investigación en arquitectura. Editorial Teseo.

Ferreiro, R. (2007). Estrategias didácticas del aprendizaje cooperativo, el constructivismo social: una nueva forma de enseñar y aprender. Ed. Trillas.

Ghonim, M. y Eweda, N. (2019). Instructors' perspectives on the pedagogy of architectural graduation projects: A qualitative study. Frontiers of Architectural Research 8(3), 415-427. https://doi.org/10.1016/j.foar.2019.01.007

Hernández, R., Fernández, C. y Baptista, M. del P. (2014). Metodología de la invetigación (6a). McGraw-Hill /Interamericana Editores, S. A.

Hernández, R. y Mendoza, P. (2018). Metodología de la investigación. McGraw-Hill Education.

Jiménez Correa, S. (2003). Investigación y proyecto arquitectónico. Revista Guillermo de Ockham 1(2), 13-40. https://revistas.usb.edu.co/index.php/GuillermoOckham/article/view/435

Jiménez, S. (2006). El proyecto arquitectónico, aprender investigando. Universidad de San Buenaventura Cali.

Khodeir, L. M. (2018). Blended learning methods as an approach to teaching project management to architecture students. Alexandria Engineering Journal 57(4), 3899-3905. https://doi.org/10.1016/j.aej.2018.10.004

Le Corbusier, J. (1959). Mensaje a los estudiantes de arquitectura. En Biblioteca de arquitectura (Décima, Vol. 6). Ediciones Infinito.

Ludeña, W. (1997). Ideas y arquitectura en el Perú del siglo XX. Servicios Editoriales Múltiples S. A.

Martínez, P. (2013). El proyecto arquitectónico como un problema de investigación. Universidad Católica de Colombia.

Mezarina, C., Moya, N., Portillo, O., Cárdenas, J. y Suasnabar, L. (2016). Modelo educativo - UNCP. Universidad Nacional del Centro del Perú.

Munari, B. (1990). Diseño y comuncación visual (10a). Gustavo Gili, S.A.

Muñoz, A. (2016). El proyecto de arquitectura, concepto proceso y representacion. Editorial Reverté.

Muntañola, J. (2011). La investigación proyectual a examen: un gran desafio a la arquitectura del siglo XXI. Conferencia inaugural de la trienal de investigación FAU-UCV 2011. Facultad de Arquitectura y Urbanismo Universidad Central de Venezuela.

http://trienal.fau.ucv.ve/documentos/Ensayo_de_postgrado_8.pdf

Pina, R. (2004). El proyecto de arquitectura, el rigor científico como instrumento poético. Universidad Politécnica de Madrid.

Purini, F. (1984). La arquitectura didáctica. Colección de Arquitectura.

Quaroni, L. (1980). Proyectar un edificio ocho lecciones de arquitectura. Xarait Libros S. A.

Sarquis, J. (2007). 1 Ficción epistemológica. Itinerarios del proyecto La investigacion proyectual como forma de conocimiento en arquitectura. Bibliográfika de Voros S. A.

Sarquis, J. (2014). Experiencias pedagógicas creativas. Bibliográfika de Voros S. A.

Sierra, R. (2001). Técnicas de investigación social. Universidad Panamericana.

Tappan, M. (2012). La investigación proyectual: Una propuesta que vincula docencia e investigación. En La investigación en diseño, una visión desde los posgrados en México (pp. 219-243). Universidad Autónoma de Ciudad Juárez.

Villagrán, J. (1988). Teoría de la arquitectura. Litográfica Rendón, S. A.

Vitruvio, M. (2002). Los diez libros de arquitectura (3a edición). Alianza Editorial.

Xue, H. y Desmet, P. M. A. (2019). Researcher introspection for experience-driven design research. Design Studies, 63, 37-64. https://doi.org/10.1016/j.destud.2019.03.001

Zamora, H. (2012). La investigación proyectual en arquitectura. Universidad Central de Venezuela.

UNIVERSIDAD CATÓLICA
de Colombia
Vigilada Mineducación

Ⓐ Orientación editorial

Enfoque y alcance

La *Revista de Arquitectura (Bogotá)* ((ISSN 1657-0308 Impresa y E-ISSN 2357-626X en línea) es una publicación científica seriada de acceso abierto, arbitrada mediante revisión por pares (doble ciego) e indexada, en donde se publican resultados de investigación originales e inéditos.

Está dirigida a la comunidad académica y profesional de las áreas afines a la disciplina. Es editada por la Facultad de Diseño y el Centro de Investigaciones (CIFAR) de la Universidad Católica de Colombia en Bogotá (Colombia).

La principal área científica a la que se adscribe la *Revista de Arquitectura (Bogotá)* según la OCDE es:

Gran área: 6. Humanidades

Área: 6.D. Arte

Disciplina: 6D07. Arquitectura y Urbanismo

También se publican artículos de las disciplinas como 2A02, Ingeniería arquitectónica; 5G03, Estudios urbanos (planificación y desarrollo); 6D07, Diseño.

Los objetivos de la *Revista de Arquitectura (Bogotá)* son:

- Promover la divulgación y difusión del conocimiento generado a nivel local, nacional e internacional

- Conformar un espacio para la construcción de comunidades académicas y la discusión en torno a las secciones definidas.

- Fomentar la diversidad institucional y geográfica de los autores que participan en la publicación.

- Potenciar la discusión de experiencias e intercambios científicos entre investigadores y profesionales.

- Contribuir a la visión integral de la arquitectura, por medio de la concurrencia y articulación de las secciones mediante la publicación de artículos de calidad.

- Publicar artículos originales e inéditos que han pasado por revisión de pares, para asegurar que se cumplen las normas éticas, de calidad, validez científica, editorial e investigativa.

- Fomentar la divulgación de las investigaciones y actividades desarrolladas en la Universidad Católica de Colombia.

Palabras clave de la *Revista de Arquitectura (Bogotá)*: arquitectura, diseño, educación arquitectónica, proyecto y construcción, urbanismo.

Idiomas de publicación: español, inglés, portugués y francés.

Título abreviado: Rev. Arquit.

Título corto: RevArq

Políticas de sección

La revista se estructura en tres secciones correspondientes a las líneas de investigación activas y aprobadas por la institución, y dos complementarias, que presentan dinámicas propias de la Facultad de Diseño y las publicaciones relacionadas con la disciplina.

Cultura y espacio urbano. En esta sección se publican los artículos que se refieren a fenómenos sociales en relación con el espacio urbano, atendiendo aspectos de la historia, el patrimonio cultural y físico, y la estructura formal de las ciudades y el territorio.

Proyecto arquitectónico y urbano. En esta sección se presentan artículos sobre el concepto de proyecto, entendido como elemento que define y orienta las condiciones proyectuales que devienen en los hechos arquitectónicos o urbanos, y la forma como estos se convierten en un proceso de investigación y nuevo de conocimiento. También se presentan proyectos que sean resultados de investigación, los cuales se validan por medio de la ejecución y transformación en obra construida del proceso investigativo. También se contempla la publicación de investigaciones relacionadas con la pedagogía y didáctica de la arquitectura, el urbanismo y el diseño.

Tecnología, medioambiente y sostenibilidad. En esta sección se presentan artículos acerca de sistemas estructurales, materiales y procesos constructivos, medioambiente y gestión, relacionados con los entornos social-cultural, ecológico y económico.

Desde la Facultad. En esta sección se publican artículos generados en la Facultad de Diseño, relacionados con las actividades de docencia, extensión, formación en investigación o internacionalización, las cuales son reflejo de la dinámica y de las actividades realizadas por docentes, estudiantes y egresados; esta sección no puede superar el 20% del contenido.

Textos. En esta sección se publican reseñas, traducciones y memorias de eventos relacionados con las publicaciones en Arquitectura y Urbanismo.

Ⓐ Frecuencia de publicación

Desde 1999 y hasta el 2015, la *Revista de Arquitectura (Bogotá)* publicó un volumen al año, a partir del 2016 se publicarán dos números por año en periodo anticipado, enero-junio y julio-diciembre, pero también maneja la publicación anticipada en línea de los artículos aceptados (versión Post-print del autor).

La *Revista de Arquitectura (Bogotá)* se divulga mediante versiones digitales (PDF, HTML, EPUB, XML) e impresas con un tiraje de 700 ejemplares, los tiempos de producción de estas versiones dependerán de los cronogramas establecidos por la editorial.

Los tiempos de recepción-revisión-aceptación pueden tardar entre seis y doce meses dependiendo del flujo editorial de cada sección y del proceso de revisión y edición adelantado.

Con el usuario y contraseña asignados, los autores pueden ingresar a la plataforma de gestión editorial y verificar el estado de revisión, edición o publicación del artículo.

Ⓐ Canje

La *Revista de Arquitectura (Bogotá)* está interesada en establecer canje con publicaciones académicas, profesionales o científicas del área de Arquitectura y Urbanismo, como medio de reconocimiento y discusión de la producción científica en el campo de acción de la publicación.

Mecanismo

Para establecer canje por favor descargar, diligenciar y enviar el formato: RevArq FP20 Canjes

Ⓐ Contacto

Dirección postal:

Avenida Caracas Nº· 46-72
Universidad Católica de Colombia
Bogotá D. C., Colombia
Código postal: 111311

Facultad de Diseño
Centro de Investigaciones (CIFAR)
Sede El Claustro. Bloque "L", 4 piso

Diag. 46A Nº· 15b-10
Editor, Arq. César Eligio-Triana

Teléfonos:
+57 (1) 327 73 00 – 327 73 33
Ext. 3109; 3112 o 5146

Fax: +57 (1) 285 88 95

Correo electrónico:
revistadearquitectura@ucatolica.edu.co
cifar@ucatolica.edu.co

Página WEB:
www.ucatolica.edu.co
Vínculo Revistas científicas
http://publicaciones.ucatolica.edu.co revistas-científicas
https://revistadearquitectura.ucatolica.edu.co/

Facultad de Diseño

Centro de Investigaciones - CIFAR

REVISTA DE ARQUITECTURA **Arquitectura**

Revista de Arquitectura (Bogotá)

Director
Werner Gómez Benítez

Editora
Anna Maria Cereghino-Fedrigo

Editores de sección
Ⓐ Carolina Rodríguez-Ahumada
Ⓐ Flor Adriana Pedraza-Pacheco
Ⓐ Mariana Ospina-Ortiz
Ⓐ Jairo Hernan Ovalle

Equipo editorial

Coordinadora editorial
María Paula Godoy Casasbuenas
mpgodoy@ucatolica.edu.co

Diseño y montaje
Juanita Isaza
juanaisaza@gmail.com

Traductora
Inglés
Myriam Rodríguez
myriamrodriguezp@gmail.com

Corrector de estilo
Gustavo Patiño Díaz
correctordeestilo@gmail.com

Página Web
Centro de investigaciones (CIFAR)

Distribución y canjes
Claudia Álvarez Duquino
calvarez@ucatolica.edu.co

CONTENIDO

Arquitectura