Three questions and several proposals: On the teaching of architectural design*

1 | Prefix adopted by the International System of Units, corresponding to 10-9 0.000000001.

2 | Prefix adopted by the International System of Units, corresponding to 109 or 1,000,000,000.

Contemporary universities: Teaching versus research?

There seems to be a consensus that most contemporary universities are structured on two basic concepts in their founding statutes: the autonomy and independence of teaching, research, and outreach activities. It can also be mentioned that in order to achieve their fundamental objectives, universities develop two seemingly divergent strategies that in practice act to support each other. These strategies are so essential to the idea of the university that in some cases they even characterize it: the first strategy is the incentive to diversify knowledge and the second is the concentration of this diversity in a common institutional space. The use of these two strategies has strong consequences on university practice. One of the most evident repercussions is the emergence, within the institution itself, of a conflict that is difficult to resolve between two types of individual that end up being part of the university substrate: the generalist and the specialist.

Attempting to explain what these two types are, we can say in a very simple and schematic way that the generalist is the person who strives to extend the frontiers of the areas of knowledge as far as possible, and at the same time seeks some approximation between the different fields of knowledge. Alternately there is the specialist, who in principle essentially devotes him or herself to a movement that is opposite that of the generalist, by looking for a single approach, extending their limits and attempting to characterize their differences with others, in a manner that is preferably objective and generally directed towards the specific or particular.

The important thing here is to understand that by recognizing the existence and simultaneous action of these figures within the universe of knowledge, we can also foresee the emergence of something that would intensify the conflict between the activities of these two trends, which are aimed at orthogonal movements of knowledge, such as that of expansion (horizontal) and narrowing (vertical). The problem may be significant precisely because these two models correspond to two of the university activities that are usually inseparable: knowledge generation and transmission. If this intensification occurs, a division between teaching and research activities will appear even though they are the recognized foundation of the university. In other words, we are talking about the emergence of a conflict between professors and researchers that should never exist, since they should in fact be one and the same subject: the professor-researcher.

Meanwhile, as is known, due the difference in the stimuli conferred to both activities (even financial), there is a tendency in present-day universities to differentiate between professors who carry out research activities and those who only teach. Just as we know that research and postgraduate studies are not accessible to all teachers, it is important to recognize that this should not happen, since many times research and postgraduate studies require skills, abilities and interests different from those required for teaching. However, it should be emphasized that these are different and not superior. The problem is that on the scale of value and importance for modern universities, which are increasingly close to being subject to management contracts, productivity indicators, and notions of business efficiency, being part of the group of those who have access to incentives and research money seems to give professors a privileged position, which is often shrouded in ideas of superiority.

It may seem evident that this division between generalists and specialists or between research and teaching creates problems. Nevertheless, it is also necessary to state that it is not only a source of conflict and disadvantages. In the case of universities, it must be recognized that there is a real effectiveness in the simultaneous practice of deepening and narrowing of knowledge. Therefore, at the same time that universities became notable for their great ability to act on almost all fields of knowledge, reaching levels of scope that were unimaginable a few centuries ago, they were also capable of leading modern society to achievements that were difficult to foresee in the past, for example, when human perception was elevated to the universes of the nano[1] and the giga[2]. Additionally, it was that model that brought us to impressive increases in the qualitative and quantitative indices of technological and scientific production. This is irrefutable and in general terms, very positive. However, in contrast,

it cannot be ignored that it also enabled and led to the establishment of a type of logic that stimulates the fragmentation of knowledge and promoted a model of scientific utilitarianism that today tends to dominate academia. Then, what we see each time we wish to delve into the issue are virtues and problems, advantages and disadvantages, which always coexist and transform any impossible agreement.

Within this structure, various movements and reactions also arise that nearly always self-regulate and seek a kind of equilibrium, leveling or inner balance. For example, the need to propose and to experiment new ways of facing reality are increasingly perceived and expressed. In order to attain levels that facilitate approaches and visions that are broader than those made viable by the multidisciplinary structure that originally constituted a large part of universities, attempts at less fragmented formulations that are at the same time less refractory and more sensitive to complex systems are beginning to gain space.

The qualitative and quantitative advances of the approaches based on these systems (registered in their multiple definitions and variations, such as non-linear, chaotic, asymmetric, discrepant approaches, etc.) prove our impression. Nonetheless, today we can perceive movements in the direction opposite to the classic idea of segmentation or fragmentation of the object, with a view to enabling a more detailed study of its parts or components. Nowadays, on the contrary in many cases the proposal is based on the growing assimilation of approximation and integration attempts and initiatives by the academic environment itself towards the different areas of knowledge. In this way, diverse proposals for interdisciplinary organization emerge in universities. When analyzed in depth, these approaches and interactions always retain the risk of deception to which we are subject when the search for interdisciplinarity lies only in authorizing the segmentation of the objects of study among the various disciplines. This tends to situations with varied interpretations of the object, based on points of view alien to each other placed face to face. However, it is worse dealing with disinterested points of view or when they are unable to analyze the repercussions of different approaches on conventional practices, as if they were always more concerned and dedicated -each in their own way- solely to preserving and protecting their disciplinary limits -and their authority- than to actually interacting and allowing themselves to be made aware of other approaches. Accordingly, if the ultimate interest were to protect and preserve limits and boundaries, what we would end up in practice reinforcing is exactly what we should avoid: specialization and fragmentation.

How is architecture positioned within contemporary universities?

When we turn our gaze the schools and colleges of architecture within this contemporary university we are attempting to characterize, we see the need to highlight some specific elements. Firstly, we can confirm that in the face of the triumphant technical and scientific development that has occurred in the last two centuries and that coincides with the development of the so-called research universities (or Humboldtian universities[3]), architecture as a field of knowledge -with an emphasis on design- maintains traces of a knowledge and trade that were consolidated long before the idea of technical rationality shaped the organization of universities.

Thus, by requesting its incorporation into the group of units in modern academia, architecture already possessed -within the university- an operational pattern based on an epistemology that was not linked to or presided over by scientific ideas, but rather by those of the group with which architecture was associated. This model, brought by architecture, was associated with the learning by doing much more than with the traditional sequential model of normative curricula (basic sciences followed by applied sciences and only after that, practical teaching). In other words, it is exactly that learning-by-doing link that enables us to explain, for example, why we can expect the projects of an architecture student to develop and evolve technically throughout his or her education during the program, while no one can assure that these projects will evolve in terms of invention, creativity or proposal quality to the same extent that they develop technically. This fact may or may not occur; although, by analogy, it makes no sense to trust that a certified architect's best work during their professional career is always and necessarily the newest, even though it is probably the product of the moment when they had the most knowledge and technical experience. This same idea applies to various activities in the artistic fields, since it does not seem wise to affirm that the best work of any writer, musician or painter should necessarily be the most recent.

A second issue that can be highlighted in the relationship between schools and colleges of architecture and the modern university is the eminently practical character of architectural design projects and their need to deal with the practical problems of reality. In this sense, it is possible to verify that normally the problems of practice in the real world do not present themselves to those professionals in charge of offering solutions with clear, and well-defined and delineated structures. According to Donald Schon[4] (1987), they tend to appear not as a problem but rather as a form of chaotic, indeterminate structures. What should be considered here is that if real problems were always well defined and delineated, a technical decision based on scientific knowledge (and therefore reproducible) would probably be sufficient. On the contrary, what we see is that in most instances practical problems -not only their solutions- must be built from materials and elements determined by and inserted into complex situations. From this arises the idea that the operations necessary to arrive at the definition of a problem, that is, the point at which it is possible to understand what the problem to be faced is and what strategies should be used to confront it (in search of solutions) are rarely well defined, thereby preventing it from being tackled with an exclusively or purely scientific method most of the time. Thus, the professional in charge of solving problems has to above all assemble, organize and construct them through a series of procedures that encompass an organization and a selection that make it possible to find coherence and that can present a new perspective on the actions to be carried out. It should be remembered here that Nelson Goodman[5] (1978) offered us the idea that the definition of problems turns out to be a kind of ontological process or a special way of communicating a world vision.

These two characteristics, the operational pattern based on the learning-by-doing process and the practical character of the activity constitute part -in our opinion- of an issue that architecture faces in the context of the contemporary university. It is difficult to communicate to academia (or to the institutional group composed of schools and colleges that adopt the scientific method as their main reference) that any practical problem of high or low complexity (be it the housing deficit of an unequal and underdeveloped country or a design for the construction of urban furniture), must obligatorily have only one correct answer. If not, there may be a group of possible, adequate and valid answers with their different gradations. What we affirm is that each case can be unique (and therefore not generalizable) and that non-conformity to the scientific model (almost always twofold, with a correct answer versus all the others that are wrong) frequently leads to the idea that there is a lack of objectivity -and rigor- in architecture. This conflict, although often inexplicit, may even exist within the architecture schools themselves, in the relationship between teachers, groups and departments related to procedures that are inspirational and have a technical-scientific basis.

For which market do we train architects?

Another factor we think is important to consider is the frequent and recurrent discussion within the schools and colleges of architecture about the direction of teaching, especially in relation to market demands. In this sense, it is necessary to take into account several considerations relating to the panorama that defines current notions of the market.

We are experiencing a historical period clearly driven by the interests of finance capital, the globalization of capital, marked by this new form of capitalism, which has unprecedented global impact, and which brings as a direct consequence what we call structural unemployment. This phenomenon is due to a wide association of factors, but of note among them is the reduction in productive investments, since corporations increasingly choose to invest their resources in financial markets instead of in production and/or advances in the field of computer or robotic production, which leads to a significant decrease in or even in some cases the elimination of traditional work.

From the combination of elements that lead to the decline of the traditional concept of long-lasting employment to the notion of temporary work, there is also the collapse of the idea of public and the overvaluation of individual ideas. Thus, replacing the old working-class model, an enormous anonymous game of individual service providers emerges, organized as many are into categories delimited by their economic integration in the world and by their decreasing capacity to intervene in and modify reality.

Architecture, as a trade and a product, is not on the verge of such transformations, as Sergio Ferro (2006) reminds us by quoting Paul Singer, "Inside the capitalist regime in which we live, the house, the room, is merchandise like any other, which is produced with the general purpose of capitalist production in mind, and that is profit" (p.105).

We will then continue to focus on questioning our subordination relationships in the face of economic power, resulting from the imperative need for the financing and implementation of architecture, or even for the reproduction of established economic and commercial practices, either in the construction of a project or in its relationship with the market that consumes architecture as a product.

Going a bit further, even within the existing discussion on the idea of training professionals for the market, we could question the effectiveness of our abilities to foresee how the market will be when current students join it. It seems improbable that in the context of a society like ours, which is subject to a constant and increasingly rapid transformation process, we will be able to offer the market an accurately trained professional who can meet future demands, many of which are still unknown. Perhaps the only answer to this is to attempt to train students with a great capacity for adaptation. By way of example, Steve Jobs'[6] declared dislike for opinion research comes to mind, since according to him it was of little use in guiding innovative actions, due to the fact that most of the people interviewed are not capable of talking about something unknown, that is, discussing something that has yet to be invented or developed. Similarly, and considering the information we have today, preparing for a market that will exist approximately a decade from now is not a task that can be carried out with absolute precision. We can interpret trends, but clearly speaking the most we can do is to prepare students with the ability to adapt.

In other words, it has to do with preparing a professional capable of understanding what the new demands are and trying to develop answers to them based on his or her own training and interaction with reality, to be able to criticize reality to find -or formulate- new questions that will have to be answered through their own professional experience. In short, we are saying that the professional of the future must be able to learn to learn through their own career. Wouldn't this exactly be the traditional model of training architects, that of learning by doing?

Some proposals for the teaching of architecture

We can conclude that the traditional model for training architects, inherited from praxis and consolidated over centuries of professional practice, presents a plausible answer to the need to train individuals capable of adapting to changes in the profession as well as those brought about by the context and the market. The more we can avoid contemporary trends towards over-specialization in education that contribute to limiting the trained professional's field of activity, this statement will be closer to the truth. As a consequence, and based on these premises, we will permit ourselves to advance several proposals for the teaching of architecture.

Initially, it is not about discussing in depth which curricular model should be proposed or practiced in architecture schools. Of course, it makes sense to discuss the emphasis or pedagogical models. However, this must be addressed in each institution, respecting its peculiarities, its internal dynamics and even its idiosyncrasies. In this sense, I also use what many education academics have shown us: analysis of what curriculum will be adopted in a school. In addition, we are measuring the strength of the various groups with different points of view and attempting to decide on a scientific basis (and therefore they can be called academics) those who really have more power within that group of decision-makers. In fact, we are verifying who will win the battle to define which worldview or which choice -within the culture- will be passed on to posterity. Therefore, what interests us in this respect is to seek answers to two questions within the pedagogical proposals. These are:

1) How can we encourage the development of people who are truly capable of criticizing reality and, based on this criticism, proposing alternatives to face this reality?

2) How can we combat the profound dehumanization of the dominant economic model in the modern world and the intense individualization not only permitted or made possible by this model, but also proposed and defended by it?

I imagine that each institution can and should find its own answers that are adapted to its own context and make them transparent in its projects and, first and foremost, in its teaching practices.

Another proposal concerns the confrontation of this harmful contrast between the supposed scientific objectivity of contemporary academia and the supposed subjectivity of architectural methods and procedures. To this end, although I am aware of the impossibility of reaching a point of consensus on the subject, since
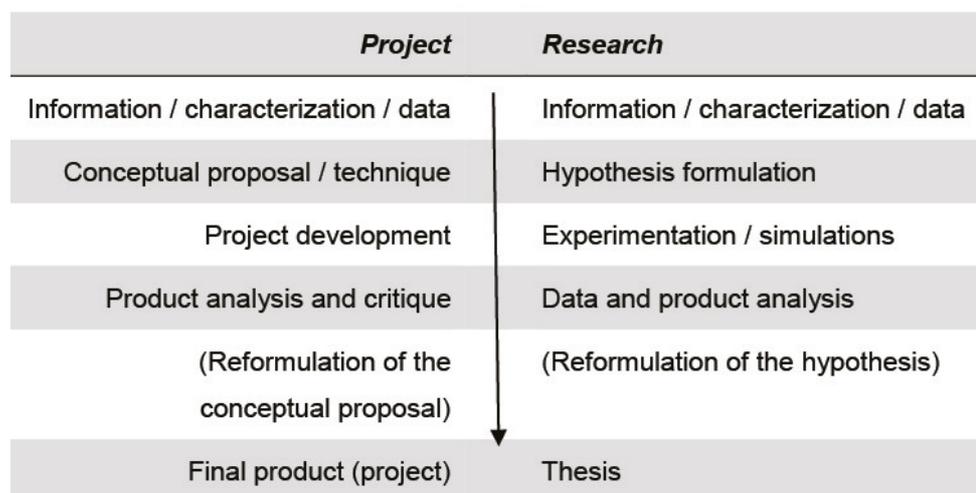
my description will never be identical to what other architects and teachers would do, for demonstration purposes I will try to simplify the teaching processes carried out in an architectural design workshop class:

(a) generically, it begins with less defined, complex and sometimes even contradictory elements or situations. These are data presented are used in the formation of the problem. This includes the intervention site, its topographical and environmental factors, as far as possible the regional socio-cultural and economic characteristics, the clients (when defined) or the community that will be served, the legislation and other regulations on buildings and land use, and available materials and techniques and their costs, among others. Generally, for these data and situations, a certain level of coherency is proposed through conceptual or technical formulations. This moment characterizes the formation of the problem, which will result in approach or intervention strategies.

b) based on the development of the proposals from the initial formulations, commonly carried out through graphic, volumetric and spatial studies, one or more proposals are drawn up. Possibly, new implications will arise from these proposals and some will be unintentional. These implications should be detected and evaluated. Throughout the process, analysis and criticism play a decisive role in revealing situations, which enable us to provide feedback on the network of project actions (and their consequences), which may even lead to the restructuring of the initial formulations.

(c) this process can be repeated as many times as necessary until satisfactory answers are found, which overcome as much as possible the deficiencies or inconsistencies pointed out in the continuous process of analysis and criticism. A possible conceptual image for this repetitive practice is that of a spiral movement, not only circular, since each time the same point is passed one will desirably be at a higher level of mastery than the previous time.

I believe that the description of this set of procedures generally characterizes the kinds of projects in most of the architecture schools I know. However, what interests me here is not to present a perfect description of a method, but rather to verify that in spite of so many considerations about the previously mentioned lack of objectivity in architecture, these procedures are very similar to the most traditional methods of scientific research. In this sense, it is worth displaying the two activities together to highlight these similarities:

	Project	Research
	Information / characterization / data	Information / characterization / data
	Conceptual proposal / technique	Hypothesis formulation
	Project development	Experimentation / simulations
	Product analysis and critique	Data and product analysis
	(Reformulation of the conceptual proposal)	(Reformulation of the hypothesis)
	Final product (project)	Thesis

Figure 1. Schematic, simplified comparison of architectural design and scientific research processes Source: the author (2019).

Maria Lucia Malard synthesizes and helps to understand the problem more clearly when she also addresses the typical process carried out in the teaching of architectural design:

> *[...] an architectural and urban problem is formulated, and it is up to the student to find a solution. In some cases, it goes a bit further and presents an outline of a problematic situation and the student is asked to set out the problem and propose solutions. It is precisely in this, developing the ability to lay out problems in situations and solve them, that the teaching of architectural and urban design of the highest quality lies, since it stimulates the student´s creative potential, developing his or her skills to formulate concepts and apply technical knowledge.* (Malard, 2005, p. 103)

Based on these considerations, I defend the idea that the procedures adopted in a design workshop class reveal a process constituted over centuries and founded on a specific type of knowledge of praxis and reflection on it. In other words, this process is grounded in research for the resolution of problems and this research is design itself. This process has a strong connection with the idea of learning by doing, for which it is essential to understand that for this very reason, the teaching and learning process cannot focus solely on the action of the teacher, but must also be defined and characterized by the action of the student and the teacher. For the same reason, we must also realize that the problem to be faced will always depend on and be conditioned by the specific way the professional has structured it, or in other words, by a practice that requires the creative participation of its implementer. Therefore, as regards the scientific method, creativity is a necessary element for the formulation of the hypothesis. That is to say, it is in the very practice of learning by doing that the professional architect, conceiving the design of a project as a creative solution to a problem, is the key to revealing all this antagonism between scientism and subjectivity is highly artificial and induced by the parties that dominate the power game in academia.

In my career as a professor, I have been in charge of architectural design subjects and today it seems natural to me to discover that it is a fundamental course in the architecture program. I imagine that all teachers in all subjects think the same way. Perhaps one can imagine that by thinking this way I will defend an immense program, nearly the size of all knowledge, and what actually comes to mind, for example, is a 1:1 scale map, a map the same size as the world it represents as described in Borges' tale[7](2003) .

No, I don't think that way. I only understand that all courses seem essential and fundamental in the eyes of their own teacher. Accordingly, I also understand that in order not to have a program the size of the world, many decisions have to be made when proposing any curriculum. Cuts and choices must be made, as in all the power struggles discussed previously.

In conclusion, I believe it is important to say I understand that if we, teachers and architects, still want to propose a better world, as we have wanted in other times, we must commit ourselves to the task of making each classroom an environment where we can stop the esthetic, political, ethical and ideological confrontations of our time, which is more and more necessary to eradicate everything that postpones human emancipation. And, above all, I hope that it will be kept in mind that it is increasingly essential in the field of education to establish a unique in-depth discussion about progressive and conservative educational projects.

7 | Jorge Luis Borges, in his short story "On Exactitude in Science" published in A Universal History of Infamy, speaks of an empire where the art of cartography reached such perfection that the map of a single province occupied an entire city, and the map of the empire, an entire province. In time, these large maps were not satisfactory, and the cartographers' associations created a map of the empire, which was the size of the empire and coincided with it in time.