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## From complexity to the teaching of synthesis: constructing the way

Facing nature, man perceives reality. Observes, analyses, synthesises and through a metacognitive process of knowledge construction, associates and dissociates elements. This process of inter-relationship between elements fragments reality into simplified parcels later rebuilt in cognitive structures that apprehend the complexity through the adoption of analytical models. A model or analytical category is a simplification of reality because it operates on the basis of abstraction, in an effort to separate the social phenomena that are embedded in the complex social reality, both in its sociological and historical aspects. This process of metacognition is a deductive and inductive, conscious and unconscious system.

*The nature, which in its being and its profound sense knows nothing of individuality, thanks to the human eye that divides the parts and constitute particular units, is to be reorganized to be the individuality that we call "landscape".* (Simmel, 1913). This citation highlights the human capacity for synthesis and the holistic understanding of the world that seeks to build on the dialectical relationship between the *world* and the *self*. Then, by desire and by reason<sup>1</sup>, man transforms the natural environment, builds, shapes, limits, occupies, reinterprets the natural. However, before doing so as material, he does it in his consciousness, imagines, designs, verifies, and by doing it this way, before being real as material, it also becomes spiritual, virtual and aesthetic.

In *bridge and door*, Simmel describes how only by perception, instrument of human consciousness to the construction of knowledge, space acquires a meaning. Only by human consciousness, the definition of what is interior or exterior exists, as well as what we associate and dissociate and all interrelationships underlying this perception.

The *bridge* symbolizes the union of something, that to be united had previously to be understood as separated. It symbolizes the ability to perceive, to wish, to create, build and transform and, simultaneously, the ability to overcome obstacles, unites more than divides. Thus, in its concept rational factors coexist with intuitive, subjective with objective, ethical and aesthetic. The *door*, in turn, symbolizes the consciousness of the infinite and the dissociation between the *world* and the *self*. The perception threshold and the vertigo of the infinite begin in human consciousness at the first moment of his relationship with the world. When we are born into the world, the *self* still fragile and unconscious, through the senses, through a synesthetic relationship, apprehends and learns the world, becomes aware, perceives the limit, fears the infinite, designs and builds the door.

The opposition between space and matter is rebalanced by human perception and consciousness in a tripartite structure that is constituted as the architecture object. We are interested in the systematization of this process, in other words, in the way that the *self* constructs the path or method of approach, knowledge and transformation into the *object*, knowledge required and prior to action, transformation, with the sense of *constant experimentation attitudes towards the sites, programs, ways to build* (Portas, N., quoted by Rodrigues).

Antonio Machado, Sevillian poet, suggests: *Caminante, son tus huellas el camino, y nada más; caminante, no hay camino, se hace camino al andar. Al andar se hace camino, y al volver la vista atrás, se ve la senda que nunca se ha de volver a pisar. Caminante, no hay camino, sino estelas en el mar.* That is, it suggests the precedence of the existence on the essence, of the *self* over the *object*.

The freedom the *self* has in the choice of the way, the impossibility of return and the construction of an individual and not transferable path, but also the junction of the *self* with the *object*, opposing the prevalent dichotomy.

When approaching reality, we can distinguish two phases, namely, knowledge and transformation, both integrated on the architectural process or project. The first phase, demand and construction of knowledge on the object, is based on observation, analysis and interaction between the *self* and the *object*, through perception and memory. The second phase is the transformation desired of the observed *object*. At the junction of both is expressed the projectual synthesis. Includes the knowledge acquired and add the response of the *self*.

Let us focus on the synthesis. The synthesis of which we speak is a simplification of reality? Or can it be a representation of complexity? The synthesis requires the construction of a method or is itself the method? And lastly, how can we teach the synthesis? Next we will try to address these questions.

### Synthesis, complexity or simplification?

In the following we start by examining this question, that leads to two distinct paths, perhaps complementary, to approach the real. Simplification, redoubt of classical science, expresses the paradigm of disjunction and reduction. Disjunction of complex elements into simplified, as well as the disjunction of the *self* (*ego cogitans*) and the *object* (*res extensa*) through the principle of non-communicability of Descartes. Reduction, by *abstract unification which annuls diversity* (Morin, s/d.). This mechanistic and rationalist paradigm, which origin remotes to the sixteenth century, has been consolidated, gradually, in the seventeenth and eighteenth centuries with Galileo, Descartes and Newton. It sees the world as a machine and tries to generalize the laws of physics to all natural and human sciences. Space and time *a priori*, are absolute. The scientific explanatory model is the prevalent model, which is applied to the entire knowledge construction and indiscriminately to all sciences.

The complexity, in turn, refers to the systemic approach of Pascal quoted by Perradeau (1996), *All things being caused and causal, favored or favoring, mediate or immediate, and linking up all of them by a imperceptible natural bond that unites the most distant and most different, I think it is impossible to know the parts without knowing the whole, and to know the whole without knowing the parts individually*. This approach to the real, as opposed to the mechanistic model, intends to integrate the *self*, seeing it as inseparable from the natural environment/object, builds knowledge by studying the processes and relationships among the components of the system/real. Echoed by philosophers like: Kant in his distinguishing between formal logic, expressed in the model of the disjunction, and transcendental logic, territory of our individual subsumptions; Hegel on the abolition of the principle of non-contradiction of Aristotle; Gaston Bachelard on the denial of the disjunction between the poetic thought and the rational thought or exclusivity and priority of one over the other.

In the *New Scientific Spirit* (1934), Bachelard describes the logic obstruction of the paradigm of simplification, demonstrating and explaining the genesis of a new scientific thinking. In fact,

the chapter *the dilemmas of geometric philosophy*, highlights the dialectical interplay that underlies the non-Euclidean geometry, opening reason to a new rationalism without immutable axioms. The geometry is now multiple, harmonizing Euclid and Lobatchewsky. Then explains the lack of contradiction between Newtonian thinking, stronghold of simplification, and non-Newtonian, stronghold of the complexity of Einstein and Planck. Defending the contraction between these seemingly divergent perspectives of research pointing the complementarity of its action. This complementarity leads us back to the initial question. The synthesis of which we speak is a simplification of reality? Or can it be a representation of complexity? In architecture, the project synthesis, which we define as the junction between the construction of knowledge about the *object* and the transformation desired by the *self*, is it, simplification or complexity? Maybe both. The synthesis requires knowledge of the parts and the whole. Prior knowledge that leads to action, the real through the eyes of the *self*, as if it were a filmmaker, in his imagination recreates a version of reality. Then by desire and by reason, conceptualizes the transformation and is by this process that the synthesis materializes itself. It is not strange to us that the first sketch of a problem contains the solution in it, or in the manner of Le Corbusier: *a problem well placed, sees its solution*. Thus synthesis is also the solution to the problem identified by the *self*. Whereby it depends on the analysis performed by him. It may be simple, deterministic and reductionist, or complex, holistic and undetermined. But make no mistake. The answer to a complex analysis can be simple. And the answer to a simple analysis can be complex.<sup>2</sup>

The complexity of the architecture thought is easily proved. In fact, we faced doubt when we try to integrate architecture on a discipline group classification. It is a social science? Or a natural science? Maybe it's both, i.e. it applies, use and belong simultaneously to both classifications. Vitruvius also describes this *architecture is a science adorned with many other disciplines and knowledge*. Integrates knowledge of natural science with knowledge of the social sciences, models the territory in response to social demands. It is art but is also technology, is the convergence of interdisciplinary knowledge, destroys disciplinary boundaries and builds transdisciplinarity.

### Synthesis is equal to method?

Let us focus now on the relationship between synthesis and method. The elaboration of the synthesis, composed, as we have seen, by the process of knowledge construction on the *object* and, at the same time, the transformation proposed by the *self*, requires the construction of a method. But is not itself the method? Let us consider this perspective. The assumption that the synthesis is method, forces us to face it as a process. In fact, the project synthesis refers to a process. But the method can only be described as synthetic? Is it the synthesis, the result of the methodological process of construction and transformation of reality? In fact, on the various stages of a project, from idea to matter, there appear to be different syntheses, each one corresponding to a moment of reflection about the real. According to this view, synthesis is a representation of complexity, the materialization of the methodological process.

Edgar Morin suggested as a method of approach to the real, complex, a change of attitude and latitude. Attitude, on the way



we face and question the paradox of the one and the multiple as an epistemological obstacle and, simultaneously, in how the *self* and the *object* are now operative and mutual construction, in extension by the enlargement of the sphere of knowledge (Husserl depth) and with new evidence of knowledge. And yet, the rhythm of acceleration and growth on the horizons of knowledge, the scientific subject is increasingly multiple, group and team. In turn, the latitude brings us to a new way of knowledge construction that Morin has dubbed dialogue plurality. Defined as the porous opening to the other, both at the individual and the object levels, and the difference expressed on the likely truth and the inner and positive function of the error. The construction of knowledge, as theory and practice, is a critique of reason and a critical reason. *A construct and deconstruct of the reasons of the reason as an eternal and relative dialogue process.* (Morin, s/d) The method proposed is thus simultaneously a reason control and the control of the reason.

This proposal of Morin is familiar to us, the adoption of a method to understand the multiplicity of reality. Indeed, in this sense and about Siza Vieira, Jacinto Rodrigues (1995, p.61) writes: *...organized ways of seeing, ways of being, thanks to a consciousness of the various "personas" that constitute the integrated unit of self. Reflect consciously is being able to understand the multiplicity of real made of logic, reason and emotion.* The creative process described leads us, simultaneously, on a voyage through the history of architecture teaching, to the Bauhaus school. As once said, Julian Huxley, about the founder of the school, *(Gropius's) lifelong aim was to work for the reunification of art and science, without which there can be no true culture.* (Quoted by Anker, 2010). Perhaps the most important lesson from the Bauhaus is this, the construction of a method that integrates the aesthetic expressive experience, the technical operating knowledge, the deductive analytical knowledge and the normative ethical self, (Rodrigues, 1989), reunifying the art, territory of complexity, with science, territory of simplification.

#### Synthesis, how can we teach it?

The project synthesis, it is taught? Or is learned? On my way to the school in which I had my graduation, I read a sentence written on its walls *Architecture is not taught.* This phrase has always made me question the truth of its meaning. Some sceptics and objectives would say, *what a no sense! Of course that is taught. Otherwise why you go to school every day?* Others, however, understand the phrase in Socrates and Plato's optical,

1 → History is made, beyond our will, not by the 'cunning of reason' but the 'cunning of desire'. Free translation, Norman Brown quoted by Gregotti, V. (2001). *Território da Arquitetura*. Editora Perspectiva. 3ª Edição. São Paulo. p.11.

2 → In the Modern Movement, a phrase has become an icon: *Less is more.* As opposed Robert Venturi writes *Less is a bore.* In the book *Complexity and Contradiction in Architecture*, (1977) Venturi criticizes the reductionism of movement, seeking to reinforce the value of the poetic and ambiguous as a method of approach to the real, complex and contradictory. However, if we consider the types of analysis and approach to real, already described, namely, where the answer to a complex analysis, can be simple and where the answer to a simple analysis can be complex, we can say that *sometimes less is more, sometimes more is a bore.*

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where knowledge is intrinsic to the individual, and an innate ability that we should seek to develop internal in an ethical and aesthetic sense. Indeed, Socrates, whose father was a sculptor and whose mother was a midwife, was defined as the knowledge sculptor and the midwife of thought. So, what is the role of the teacher? Is he the structure on which the consciousness of the student holds itself? Like ivy? Or is the gardener? Pruning here, watering and fertilizing there. The use of the analogy of teacher-gardener of Comenius puts the focus on learning to learn, a process of awareness, self-regulation and metacognition by the student.

Thereby, we are talking about learning to learn, that is the development of the ability to structure a method of constructing knowledge. Thus it is necessary to reflect on the factors that affect learning, particularly in the pedagogical articulation between the metacognitive dimension and the creative dimension. The metacognitive dimension described as the ability to understand, analyse and control our own learning mechanisms, encompasses the perception and control of factors and personal characteristics, including self-concept, self-esteem and self-efficacy, and characterizes the human being as a cognitive processor.

In turn, about the creative dimension, there is no consensus on its definition, appearing associated with multiple aspects such as creating new combinations of ideas and pre-existing knowledge, the unique personal characteristics, the articulation of these personal characteristics with intrinsic motivation and our preferences, creating the original production and, finally, a dependency of perception, imagination, involving the creative act and the processes of memory to agglutination of metacognitive processes used in problem solving. Creative thinking is a thought that leads to structuring methodology, justification and testing of concepts, even in the most expressive artwork but with a subliminal and unconscious character.

In short, the answer to the question, in architecture, synthesis, how can we teach it? Seems to be revealed on the articulation between these two pedagogical dimensions, the metacognitive and the creative, building a method that integrates the aesthetic expressive experience, the technical operating knowledge, the deductive analytical knowledge and the normative ethical self, by converging the educational paradigm of Jacinto Rodrigues (2008), the theory of complex thought of Morin, the theory of education through Art, initially defined by Plato and developed by Herbert Read and the theory of progressive education of John Dewey.

