

# The University of the future

Saverio Mecca  
Elisabetta Cianfanelli  
Federico Cinquepalmi  
Massimiliano Condotta  
Debora Giorgi  
Alberto Giretti  
Antonella Trombadore  
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Towards a new knowledge  
ecosystem

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Matteo Zambelli



UNIVERSITÀ  
DEGLI STUDI  
**FIRENZE**

**DIDA**

DIPARTIMENTO DI  
ARCHITETTURA

*Copertina*

David Matthew King, "Teardrop stone", 9x12in.  
watercolor on watercolor paper, 2020.

*Progetto grafico*

**didacommunicationlab**

Dipartimento di Architettura  
Università degli Studi di Firenze

Susanna Cerri

Matteo Zambelli



**didapress**

Dipartimento di Architettura  
Università degli Studi di Firenze  
via della Mattonaia, 8 Firenze 50121

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ISBN 9788833380995

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# #7

## Designerly ways of thinking

Matteo Zambelli

The way of thinking as a creative designer has specific characteristics that an educational platform must absolutely take into consideration.

## **An educational platform for the area of creative design in the field of architecture and design must be based on identifying the cognitive dimension of the ways of learning, understanding and acting like a creative designer that distinguish it from any other discipline.**

The English scholar Nigel Cross has explicitly spoken of Designerly Ways of Knowing and design (in the English meaning of the term) as a discipline to be taught at a basic education level alongside the sciences and humanities. Cross distinguished three cultures: scientific culture, humanistic culture and design culture. His starting point was the results of the research project entitled “Design in general education” (1979) conducted by the Royal College of Arts with the aim of defining the “third culture” in the best possible way and of expressing “Design with a capital D”. The report illustrated the differences between science, humanities and design, to make it clearer what is meant by design and what is unique to it.

- The study phenomenon in each culture is:
  - in science: the natural world;
  - in the humanities: human experience;
  - in design: the artificial world.

- The appropriate methods in each culture are:
  - in the sciences: controlled experiments, classification, analysis;
  - in the humanities: analogy, metaphor, criticism, evaluation;
  - in design: modeling, pattern formation, synthesis.
- The values of each culture are:
  - in the sciences: objectivity, rationality, neutrality and concern for “truth”;
  - in the humanities: subjectivity, imagination, involvement and concern for “justice”;
  - in design: pragmatism, naivety, empathy and concern for “appropriateness”<sup>1</sup>.

### Creative designers are “finalised for solutions”

Nigel Cross, taking inspiration from the results of Bryan Lawson's experiment which had shown how creative designers are trained to solve problems and not to analyse them, maintains that a fundamental characteristic of creative design activity consists in its reliance on the speedy generation of a “satisficing” solution rather than getting lost in in-depth analysis of the problem. Cross changes the concept of Herbert Simon's satisfactory solution, according to whom the creative design process is a process of “satisficing” rather than “optimising” the solution; that is, the creative design process consists in producing any of those that could belong to a wide spectrum of satisfactory solutions rather than trying to generate “the” best solution, impossible to achieve.

While scientists can suspend judgment with the excuse that more research is needed, the creative designer is obliged to produce a specific and unique result, feasible in a precise and limited period of time. It is for this reason that the creative designer is oriented towards the solution and not the analysis of the problem.

## I progettisti affrontano problemi mal definiti

The characteristic of creative design problems is that they are poorly defined or poorly structured. Poorly defined problems are the problems for which the designer has neither a formula, nor a procedure, nor all the information necessary to solve them with the certainty of the correctness of the result obtained.

In such a context it becomes clear why a solution-oriented strategy is preferable to a problem-oriented one: you can proceed at will with the analysis of the problem, but

**the objective of a creative designer is, and remains, the proposal of a solution.**

It is only in terms of a hypothetical solution that the problem can be contained within manageable borders. What designers tend to do, therefore, is to try to impose a guiding principle or “primary generator” capable of delimiting the boundaries of the problem and suggesting the nature of its possible solution.

Cross then refers to some authors who warn against confusing creative design with science and publishes some quotes<sup>2</sup> which qualify the peculiarities of creative designers’ ways of thinking.

“The scientific method is a pattern of problem-solving behaviour employed in finding out the nature of what exists, whereas the design method is a pattern of behaviour employed in inventing things of value which do not yet exist. Science is analytic; design is constructive” (Sydney A. Gregory, 1966).

**“The natural sciences are concerned with how things are... design, on the other hand, is concerned with how things ought to be” (Herbert Simon, 1969).**

“To base design theory on inappropriate paradigms of logic and science is to make a bad mistake. Logic has interests in abstract forms. Science investigates extant forms. Design initiates novel forms” (James G. March, 1976).

### **Construction and abduction**

The way of thinking of a creative designer is characterised by being constructive, because: “The creative designer recognises (consciously or unconsciously) that some ingredients must be added to the information he already has in order to arrive at a unique solution [...]. The creative designer must go in search of an extra ingredient and to do so he uses his ability to conjecture and think in an original way. So, what is this extra ingredient? In many cases, if not in most of them, it is an “ordering principle”<sup>3</sup>.

Constructive thinking is based on a form of abductive reasoning. Such a form of reasoning, according to Charles Sanders Peirce differs from deductive and inductive reasoning because “deduction proves that something must be; induction shows that something is truly operational; abduction simply suggests that something might be”.

**Abduction is a form of reasoning defined as creative par excellence, because it formulates hypotheses that allow for logical leaps, that is, linking known information to potentially new knowledge.**

Any platform should stimulate “reckless” links between the items of information it contains to stimulate creative thinking.

## Dangerous liaisons

The cognitive psychologist Philip Johnson-Laird maintains that the product of an act of creation “is formed from existing elements, but according to new combinations for the individual and (in the most fortunate cases) for the whole of society”<sup>4</sup>. In perfect harmony with the psychologist, Bruno Munari in the book *Fantasia* claims that

**"the product of fantasy, like that of creativity and invention, arises from relationships that thought makes with what it knows".**

“The imagination will therefore be more or less fervent if the individual has more or less ability to make relationships [...]. If we want the child to become a creative person, with a developed and not a suffocated imagination (as in many adults) we must therefore make sure that the child stores as much data as possible, within the limits of his possibilities, to allow him to make as many relationships as possible, to allow him to solve problems every time they arise”<sup>5</sup>. To be creative, and therefore to design, it is necessary to possess a vast reservoir of knowledge, hence the essentiality of the history of architecture, from which to source and establish relationships and connections, as that reservoir is memory.

In architecture and design, knowledge is called references, precedents or cases, which are nothing other than examples, total or partial, of architectures, of design artifacts, of paintings, of

installations, of sculptures, of novels, of films, etc., which can be reused in various ways (from the generation of the concept to the solution in detail) for a new project, after having been recalled by memory. The use of examples is typical of any creative activity, and it is no accident that in architecture and design schools, creative design courses are based on the illustration and explanation of examples from the past or present, and many authors from different creative disciplines recognise the importance of using knowledge from the past.

## A platform for teaching creative design must develop navigation and visualisation systems that stimulate the spontaneous generation of relationships between the examples stored in it.

### Case-based design. The role of past experience

The cognitive model based on the creative reuse of past knowledge stored in the creative designer's memory bank is known as case-based reasoning, and when applied to architecture is called case-based design.

Case-based reasoning is a cognitive model formulated in the late 1970s by artificial intelligence scholars and cognitive psychologists with the aim of improving a computer's ability to perform intelligent tasks. The basic idea was to be able to discover what humans do when they think and learn in order to model these activities so as to build smarter machines. Christopher K. Riesbeck, computer scientist and expert in artificial intelligence, and Roger Schank,

cognitive psychologist and expert in artificial intelligence, whose studies are at the base of CBR theory, claim that

## **case-based reasoning is the essence of how humans work. People reason from experience.**

“They use their experience, if they have a significant one available, or they use the experience of others in order to derive information from those experiences”, and, the scholars continue, “virtually, whenever there is a case from the past available about which to reason, people will find it and use it as a model to make their decisions in the future. This ‘case-based reasoning’ process can be very beneficial for those who have to make decisions and know a large number of cases and have been able to index them in a such a way that the most relevant cases come to mind when they are needed”<sup>6</sup>.

The case-based reasoning approach overturns the traditional cognitive model - according to which knowledge resides in human memory in the form of general and abstract principles, as are rules (in which case we refer to “rule-based reasoning”), and models (in which case we speak of “reasoning-based on models”, otherwise called “reasoning starting from first principles”), and people reason by applying the principles appropriate for the problems they face - arguing that when a person reasons, he/she does not create relationships and links with abstract elements of knowledge, but remembers and recalls “concrete examples” of the past in order to compare them with a new situation, to take, by virtue of these, adequate decisions to solve a particular problematic situation or to understand a situation.

The advantage of a case is that it offers those who need to solve a problem a concrete example of how a similar problem has been solved in the past. It is a very efficient, fast way, and it is based on not too complicated inferences.

Case-based design is an advantageous cognitive mechanism for creative designers who, given that they do not possess “formulas” to solve a problem and be sure of the correctness of the result, can however resort to cases which, recalled and recombined, can satisfactorily solve a poorly defined problem in a reasonable time. Any platform dedicated to creative design subjects must contain suitably indexed cases in order for them to be summoned.

### **The “sketched” dialogue between teacher and student. The place where knowledge is put into action**

The “locus” where the student puts knowledge into action is in the dialogue sessions on creative design with the teacher. It is an intermediate context between professional practice and the specialist world of academic knowledge. Here the student learns by doing in two ways: dialogue (maieutic) with the teacher and the sketch.

**The sketch is a meta-language through which the creative designer is able to translate the abstract thought of a functional request into an artifact.**

According to Nigel Cross, one of the inherent characteristics of the way of thinking of a creative designer is the ability “to think in the

form of sketches, in this way the abstract patterns of user requests are translated into the concrete patterns of a real object”<sup>7</sup>.

The designer's thought processes are based on the relationship between internal mental processes and their expression and representation in the form of sketches. Santiago Calatrava states that “you start by seeing the thing in your mind, it does not exist on paper, and then you start making simple sketches and organise things and then you put one layer on top of the other [...]. It is above all a question of dialogue”<sup>8</sup>.

By recognising the dialogue or conversation between internal and external representations means admitting, says Nigel Cross, that “design is reflective”<sup>9</sup>. The sketch is a medium that allows you to express preliminary ideas on which to reflect. Ideas to be taken into consideration, to be reviewed, to be developed, to be cancelled and which can be revisited.

All these verbs act during the correction sessions in the form of dialogue and illustration between teacher and student, between expert and novice. It is precisely there that the aspiring creative designer learns, when the teacher analysing together with the student the sketches and illustrations which is the precise one during the design process that manages to bring out his student ideas and give them shape or a new rearrangement by suggesting project references that he/she believes have solved or can solve similar issues and teaching, through dialogue and sketching, inexperienced students how to develop that case or cases adequately.

According to Donald Schön, architecture is the discipline in which “reflective conversation between the professional and his objects”<sup>10</sup> takes place to the maximum degree during action, and that “reflection in action” is a professional competence typical of creative designers.

A digital platform for/by designers must implement tools that sti-

mulate and encourage reflection in action during the correction sessions, otherwise it is destined to remain unused.

### Note

1. Nigel Cross (2006), *Designerly Ways of Knowing*, Springer, London, pp. 1-2.
2. *Ibid.*, pp. 7-8.
3. *Ibid.*, p. 8.
4. Philip Johnson-Laird (1994), *Deduzione Induzione Creatività. Pensiero umano e pensiero meccanico*, Il Mulino, Bologna, p. 163.
5. Bruno Munari (1999), *Fantasia*, Laterza, Roma-Bari, pp. 29-30.
6. Riesbeck, Schank (1989), *Inside Case-Based Reasoning*, Lawrence Erlbaum Associates, Publishers, Hillsdale, New Jersey, cit. nel paragrafo "1.3 The Basic Planning Algorithm" (ebook edition).
7. Cross, cit., p. 33.
8. Bryan Lawson (1994), *Design in Mind*, Architectural Press, Oxford, p. 8.
9. Cross, cit., p. 33.
10. Schön, Donald Alan, (2006), *Formare il professionista riflessivo. Per una nuova prospettiva della formazione e dell'apprendimento*, Franco Angeli, Milano, p. 79.