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Research for design education: Some topics

Pesquisa para o ensino em design: alguns tópicos

Antonella Penati
antonella.penati@polimi.it
Milano Polytechnic. via Durando 38/A, Milano, Italy

Abstract

In advanced industrialised companies, knowledge has become one of the main productive strengths. Universities have always been and continue to be big organisations aimed on one hand at the growth of knowledge through research and, on the other, its dissemination through training. This is why the training education process, with the relative methods, dynamics and specific phenomenology has, for some time now, been the focus of the obvious interest of the world of research which, from activities aimed at corroborating the contents of education, also becomes an activity aimed at questioning the forms and models of education. This recognitive contribution intends to propose a reflection – starting with the experience of managing educational processes matured at the Department of Design of Milan Polytechnic – with regard to certain macro-issues relating to the practices of education on the project around which new research interest and new experimentations are developing.

Key words: theory, practice, experience, context verbal, visual.

Resumo

Em avançadas empresas e indústrias, o conhecimento tornou-se uma das principais forças produtivas. As universidades são organizações que visam, por um lado, o crescimento do conhecimento através da pesquisa e, por outro, a sua difusão através da formação. É por isso que o processo de educação, formação, com seus métodos específicos, dinâmicas e fenomenologia própria, têm, há algum tempo, o foco de interesse em pesquisa. Estas podem estar voltadas para o desenvolvimento dos conteúdos do ensino, tornando-se uma atividade questionadora quanto às formas e modelos de educação.O presente artigo propõe uma reflexão - começando com a experiência de gestão de processos educacionais realizados no Departamento de Design do Politécnico de Milão - com relação a determinadas macro-questões relacionadas com as práticas de educação sobre projeto em torno do qual, interesse de pesquisa e novas experimentações estão se desenvolvendo.

Palavras-chave: teoria, prática, experiência, contexto, verbal, visual.

Research and theoretical reflection on the history of discipline: education as a priority

This recognitive contribution intends to propose a reflection – starting with the experience of managing educational processes matured at Milan Polytechnic – with regard to certain macro-issues relating to the practices of education on the project around which new research interest and new experimentations are developing. Often, these interests or demands for research emerge directly from the didactic experience and problems relating to the pertinent dynamics.

The list is undoubtedly fed due to the fact that, within the specific sphere of design, theoretical research and experiments have a long-standing tradition: from the theories and practices developed to offer education on the processes of configuration and formal synthesis (the scope of research and reflection which opens up to an extensive series of collateral researches), to the dialectic relations between creative intelligence and methodical thought; to the relations that are set up between theoretical disciplines and laboratory practices (theory-practice); to the forms of an interdisciplinary nature and to the processes of reciprocal enrichment between disciplines called upon to converge around design problems; to the epistemologies of the creative act and, in particular, to the experimental researches that work around the logical elements that link the process of contextual analysis to the definition of form and design resolution; to complex studies of the user and of the numerous influences that characterise the design phase; to relationships between basic education and specialisation and between academic education and practi-

cal-professional training; to the definition of the methods that can be used to assess the student's talent for design during the recruitment phase, progressing up to researches finalised at mapping the new design professions, defining a new taxonomy, and to the those aimed at building ratios – not just those of an economic nature, capable of registering the role of the design activity as an activity intrinsically addressed at generating change and innovation and as an engine to drive the creative industries.

The list could definitely go on. Within this broad framework, in the space available in this report I have decided to look at two issues – which I would call thematic clusters, due to the series of sub-problems that each one has developed over time – which, in this case, I will look at not in conclusive terms but with the aim of opening up a debate on the range of problems tackled by the research into design education.

First of all, I would like to say that neither of these two thematic clusters is completely new, and they both find ample space in the intense debate that has accompanied the history of this discipline (Burdek, 1992 and Bonsiepe, 1975). A debate which has come to no conclusion and now faces new problems.

In fact, if we scroll through the recurring themes in today's theoretic reflection on design and on its education and research institutions and practices, it seems that we are still immersed in an experimental phase (Pizzocaro *et al.,* 2000) which can be connected to the ever-changing and constantly transforming nature of this discipline due to the obvious links between design and the artificial world; an ever-changing transforming world.

Theory-practice

A first theme which has always been central to the reflection of design education is the theory-practice relationship (Maldonado, 1974).

The path of design education comprises a series of activities aimed at refining both the theoretic aspects and the instrumental and operational skills necessary to design.

The combination of different didactic experiences aims – or at least should aim – to form in the student that which, with Abercrombie (2003), we can define as the capacity of **"***operational judgement*". A capacity which, regardless of the specific skills and instruments of design disciplines, likens design to other disciplinary and professional spheres with which, in the world of research and particularly research into education, new and interesting comparisons are being made.

The theory-practice dialectics are currently receiving new attention within the educational systems. Also within those systems which, despite not having historically paid much attention and given extensive space to applicative experiences in the educational process, and preferred, for years, to follow the logic of an education conceived as the practical application of theory that had to be supplied as a priority, if not exclusively, in recent years – at least in Italy – the didactic path has been rearranged in the so-called system of "three + two" which issues, at the first level, a qualification that certifies the possession of autonomous professional skills by those entering the job market. Research into education processes has triggered a reflection on the sequences of learning, thinking back to the traditional theory-practice order and opening up interest in the investigation of the effectiveness with which the definition of professional skills is perceived through forms of *learning by experience*.

With respect to learning activities within the sphere of design, however, there has always been awareness that, through certain specific opportunities of design practice, it is possible to mature those skills necessary to the formation of professional figures equipped with a complex critical and operational knowledge. Consequently, there has been no lack of space for theoretic reflection.

The problems that seem to take on a central role in the research concern, on one hand, the methods and opportunities of learning from experience and, in close connection, the forms of reuse and transferral of the knowledge acquired.

Learning from experience

In the didactic experiences aimed at the acquisition of design skills, or the transmission of capacities to operate heuristically, design exercises occupy a lot of space. The judgement often attributed to this type of educational activity is that design simulations show their effectiveness in increasing the technical aspect, in acquiring operational and instrumental abilities (Lazzarini and Cugno, 1999) and that, vice versa, the cognitive knowledge that lies behind competent acts such as design cannot be learned from practice.

More recent researches, on the other hand, have focused attention on the cognitive dimension which is involved in the design simulations that form the place in which the mixture of theoretic knowledge and practical skills, between new experiences and old experiences, between primary know-how and accessory know-how acquired in an operational and situational way is created.

These researches into reassessing the role and the effectiveness of "active learning", especially in training aimed at those professional activities where the prescriptive components interact strongly with the discretional components (Ceriani, 1996), focused particularly on the organisation of the programmes of the design courses needed to build design opportunities in which the breadth, depth, complexity, variety and overlapping of the situations it is applied guarantee structured training (Bonsiepe, 1995).

The attention of these researches is focused more on the didactic method and process than on the design result and the motivations that support choices in a constant comparison between regulatory aspects, given by the simple application of technical knowledge and abilities and discretional aspects, developing critical and speculative skills, as well as communicative and behavioural skills, all ingredients that intervene in solving problems (Schon, 1993).

The aim, in these researches, is to emphasize how learning from experience cannot be traced back to learning from practice or through practice, because the practical solving of problems represents just one of the aspects involved in the experience.

In his work entitled *L'uomo artigiano* (Sennet, 2009) Richard Sennet grasps the wealth of the term experience

starting from the German language which uses two words: *Erlebnis* and *Erfahrung*. "The first indicates an event or an action or a relationship which provokes an inner impression, the second an event or a relationship which opens up the subject towards the outside and requires technical abilities more than sensitivity". The pragmatist though of which Sennet is an exponent has insisted on the need to avoid the separation of these two meanings. Starting with the wealth of meanings encapsulated in these two terms, Sennet calls attention to the form and the procedure, i.e.: the *techniques of experience* because the cognitive and the technical-practical components can connect and develop (Bordieu, 2003).

The role of the context in the formative experience

It is known that in design education systems, an inductive approach to design was used and this has had an experimental evolution over the years – known as the *Fundamental course*. This method, adopted initially at the Bauhaus and then at the Ulm school was born with the aim of stimulating cognitive skills, not anticipating the theory but reflecting on the analysis of the design experiments carried out (Bürdek, 1992).

Despite acknowledging that this experience comprises elements of outstanding interest (Lindinger, 1988; Bonsiepe, 1995), the model of the *Fundamental course* has also received considerable criticism by those who contributed to the experimentation. Gui Bonsiepe, for example, in measuring the positive aspects related to the logic of adding a progressively growing number of design variables to the growth in the design skills of the student, also criticised the excessive focus of the course on the aspects of formal refinement linked to the dominance of exercises of morphogenesis, use of colour and textures to the detriment of variable such as use, production, costs and characteristics of the materials considered to be excessively distant from the student's initial design capacity. The formal configuration process is not carried out autonomously but is connected to the formation of concomitant opinions on utility, attraction, economy, safety, comfort, environmental compatibility, etc.» (Bonsiepe, 1975 e 1995)

More generally, in every simulation process, reality cannot be divided into small parts and the phenomena cannot be studied one at a time, isolated from their context, extracting one or a few factors (Parisi, 2001).

These reflections are renewed in the face of the rather recent realisation that every design system is born within a context and the latter occupies a central role in two senses. In the researches, there are at least two references specific to the context of the formative action are traced.

On one hand, the context "contains" the didactic design action and permeates it with all the technicalities of classroom activities, with the interaction between students and between teacher and students.

In this case too, there are numerous innovations and experimentations, Probably the most interesting theoretic substrate comes from social sciences and from the psychology of interaction and reference to the term "*community of practices*" is which best sheds light on the process of construction of shared meanings, built into a didactic context.

In this case too, however, the results that emerge are deeply rooted in the unique, local position that has defined them and they are consequently less predictable and generalizable than the traditional theories on learning have led us to believe (Talamo and Zucchermaglio, 2003).

From a second angle, the context is the object of the design action and it refers explicitly to the combination of restrictions, resources, opportunities and players in the design action.

In this second situation as well, attention to the context leads us to waive the hypothesis that the results of an action to acquire knowledge have general validity. It is explicitly assumed that their value is local and it is therefore interesting to assess the situational distance that separates the context from any further contexts of application.

From this further angle, the aims and objectives of the design action make up one of the variables that characterise the context and its influences of the outcomes of the learning experience.

Some researches highlight the not completely transparent nature of the processes of growth of knowledge that take place within design actions. The knowledge acquired within the design process is *opaque* and this opacity depends on the purpose for which the research or design action is being carried out. Finalised knowledge is born as knowledge contaminated by its purpose, because the cognitive act behind the processes of innovation strongly ties knowledge to interest and makes us see things in a selective way, because the attention is captured by certain aspects, while we remain indifferent to others.

Whether or not intentionality conveys meaning to things, whether or not intentionality allows recognition, is a question which has been extensively investigated by the gestalt theories, which have concentrated particularly on acts of designation and finalisation as important modalities with different connotations – through the intentionality encapsulated within these acts – and mental constructions of a problem (Kanizsa, 1980).

It is a typical operation of reduction of complexity through processes of focalisation which leads us to select just some information, ignoring the rest, finalised at the cognitive aims.

As if this were not enough, we face not only a cognitive result which is the outcome of an opaque process – a process which has not allowed the retention and enhancement of most of the information which has been considered irrelevant – but also *sticky* knowledge.

Cardini describes knowledge that is the outcome of a finalised action as a form of sticky knowledge (Cardini, 1997). *Sticky knowledge* is the term he uses to identify forms of knowledge that are influenced, during the cognitive process, with additional and complementary knowledge that converges into clarifying the particular cognitive area under investigation, producing knowledge which adheres to the problematic context. It's as though the process of finalised knowledge were to reduce – through opaque processes, processes of focalisation – part of the complexity of the context and, at the same time, add details, interpretative contaminations that make the knowledge absolutely connected to the purpose.

I believe these few hints, given as examples, are sufficient to restore the wealth of implications adopted by

theoretic research in verifying the possibility to reuse what has been learned in a design situation which, every time, is considered unique. Donald Schon (1993), known for his work on epistemological issues linked to professional action, starting from didactics as a place for reflection on its own phenomenology, has shown how the systems of images, comprehensions, actions, interactions and narrations, built up within a specific design experience, can be activated and used only if the sense of the new situation is able to be retraced to what is already present in the existing repertory.

According to Schon, our behaviour is dictated by the logic of "exemplary" or paradigmatic cases analysed by Kuhn, and touches on that concept of pregnancy (Gregory, 1998) defined by Rudolph Arnheim (1979) in relation to processes of formal constitution. The experiences gained, in other words, lead to the construction of a repertory of cases and exemplary problems on the basis of which, in subsequent situations, we are able to compose new sequences of action using processes of change. In this process, it becomes necessary to perfect a theory capable of coping with the mental and cognitive processes through which we are able to identify analogies and similarities between that learned the new situations we have to face (Bara, 2000).

Besides having a good definition of the criteria of *analogy* and *similarity* which allows us to properly transfer the explicit knowledge linked to the *knowledge of what* (Legrenzi, 1994), the research also looked at the comparison of contexts (Rogers, 1983) identifying which characters of context have to be similar for the transferral to be effective.

Some researches in particular have concentrated on the analogies of problematic context, assessing that the transferral of knowledge related to the subject is actually quite simple, while the change in strategic context, for example, the change in resources and opportunities, the change in time scale of the design operation, etc., is critical.

Certain theories look at yet another aspect of these dynamics, shifting the interest from the process of transferability of knowledge related to the subject and the context, to the transferability of process knowledge, considered as behavioural and experience-related knowledge, which is formed in the design (Petroni, 2000). In this case, it is particularly interesting to find modalities suited to holding and transferring those parts of tacit knowledge, i.e.: the knowledge that can be expressed in terms of *knowing how to act* (Polanyi, 1979) which occur when we do things and linked both to forms of routine action and ability to perform, ways of acting, tricks of the trade that possess a sort of behavioural automatism, rather than specific types of knowledge and skills.

Gui Bonsiepe for example, claims that «the methodology of design is based on the assumption that, in the design process, despite the variety of problematic situation, there is a common underlying structure, a series of constants that form the framework, creating an abstraction of the particular content of every single design problem» and it is the reinforcement of this framework that has to be pursued in the exercise of the design (Bonsiepe, 1975). And this framework which, with Bordieu, we can call *habitus,* designs a way of being, a habitual condition, a predisposition, a tendency, a leaning, an inclination and is made up of languages, behaviours, cognitive models, methods and operating logics that are automatically triggered (Bordieu, 2003). Habitus encourages behaviour moulded through practice and, to use Bordieu's words again, possesses all the properties of instinctive behaviours.

Towards a theory of *mental schemes*

The type of knowledge that characterises instinctive behaviours, in which the prescriptive components often risk being overcome by those of a discretional nature, moulded by beliefs and values, has been subject to extensive study within the scope of the so-called *helping professions* i.e.: those professions which, in the medical and psychiatric field, are linked to prompt intervention in which interaction with the patient, the ability to immediately decode messages – which are often contradictory – with which the need and request for intervention by the patient and by other players is expressed, and also the characters of the context in which the intervention takes place, require a capacity for judgement, of discernment during the action. *Operative judgement* is the term, as mentioned at the beginning, used by Jane Abercrombie, an author who has done a lot of work on the possibility to correctly mature that discretional, subjective and personal component which, if not trained, risks making the capacity for design intervention misleading, through didactic training.

In her book entitled *Anatomia del giudizio operativo*, Abercrombie explains that our capacity for judgement rests – and is strongly influenced, for better or for worse – on "*mental schemes*" which draw on the combination of theoretic knowledge and specific skills but also on performance practices acquired through experience. Mental schemes are unconscious components, capable of directing perception and influencing processional intentionality.

If on one hand, the mental scheme pre-constitutes a series of solution, reference and instinctive habits deriving from experience, like a sort of historical memory necessary to make professional operation effective, on the other, it takes on a defensive role, creating stereotypes, conformism and pre-interpretations that often aim to take control of perceptive chaos through simplifications.

For Abercrombie, it is indispensable, in the educational process, to expose the student to constant practical and experience-related tests on that learned at theoretic level, to form flexible and effective operating schemes that reduce the defensive component within the use of mental schemes.

In an educational process that aims to build a professional habitus, in the sense defined above, and an effective system of mental schemes, it is necessary to pay considerable attention to the perceptive process and to the communicative processes that allow us to encode and transfer knowledge.

Verbal-visual

A second cluster of researches relating to education concentrates on redefining the role played by languages today. In these researches, carried out also within spheres that are central to design, the role of verbal language as

the only way of transmitting knowledge is questioned (Sasso and Toselli, 1999).

The theme is one of the central issues of debate within the culture of design and directly influences the design education process. This is a sphere in which the production of theoretic contributions – which there has never been a lack of – is currently witnessing a new and recent revival stimulated by the diffusion of new IT and digital media and by the spread of new forms of communication increasingly characterised by the prevalence of the image. The domination of visual culture has induced reflection on the survival of reading and writing as dominant forms of transmission of knowledge and learning.

Giovanni Sartori (2000), in a book written a few years ago, had announced the birth of a *homo videns* which is the result of society which produces images and cancels concepts. I think that Sartori's stance is drastic. However, it contains interesting areas of analysis linked to the transformation of *cognitive styles*. Therefore, that is where I would begin..

With regard to the fact that every transformation of the container, of the medium, brings with it the transformation of the contents, much has been said. Equally consolidated is the awareness of how the change in the nature of the content and the container, deeply transforms the cognitive methods.

I would like to pause briefly on this second aspect, particularly because it enables us to reflect on the types of knowledge and the channels of learning concerned with design.

Raffaele Simone (2000), a linguistics professor at Rome University, introduces us to a new phase in the history of knowledge, in the history that should describe the way in which our knowledge, ideas and information are created and developed, which he describes as *Phase three*.

Phase three because, according to the author, it is preceded by at least two more big phases.

The first coincides with the invention of writing and the possibility to use written signs to write information on a stable support, freeing the individual and collective memory from the weight of an enormous amount of data.

The second, almost twenty centuries later, is the silent revolution – which Elisabeth Eisenstein told us about – which coincides with the invention of printing. This is an invention which made books, which had been incredibly expensive and impossible to reproduce up until then, accessible to a vast audience, deeply altering various aspects of cultural and social life. From then on, for several centuries books were, and still are, a sort of symbol of knowledge and culture.

These two phases give us two extremely important methods of forming and storing knowledge: reading and writing. The issue is far from banal: our culture, our mentality is anthropologically in debt to the alphabet. Ours is an *alphabetical culture*.

Simone (2000) also defines the *alphabetical vision* of that method of vision that allows the acquisition of information and knowledge starting from a linear series of visual symbols. This method becomes a perceptive method and trains a sequential, linear and also analytical intelligence. It is the possibility to build articulated propositions that allows the expression of refined and investigative though that characterises us.

Today we have moved on to a phase in which evolved knowledge is acquired by listening (i.e.: the ear) or through non-alphabetical vision (which is a specific modality of the eye) through a form of simultaneous intelligence characterised by the capacity to handle a large amount of information at the same time without the possibility to establish an order between them, a succession and consequently a hierarchy. It is a form of intelligence linked more closely to the dynamics of synthesis than to those of analysis and furthering, of the articulate and complex knowledge typical of an alphabetical intelligence.

The heuristic knowledge at the basis of creative and discovery processes, not just those behind the design action, but also those that take place in the world of science, is based upon a type of intelligence that has more to do with pictures than words, more to do with synthetic visual intelligence that verbal and alphabetical intelligence. One of the most current fields of interest occupying the philosophers of science is close to the typical dynamics of creative thought. Gerald Holton (1983) in the 1980s dedicated a text to *scientific imagination* describing the role that creative thought has played in many processes of scientific discovery.

Holton's theory is that, in the growth processes of knowledge, where the heuristic procedure is dominant, *visual thought*, the thought triggered by *mental images*, images which very often are only subsequently recomposed in logic-mathematical or logic-verbal intelligence, take on great importance.

Visual thought: culture and practice of design

In educational processes and particularly design education, visual culture and *visual thought* (Arnheim, 1979) have always played a central role as a necessary "substrate" to read the contemporary languages and as a process of imagination which draws on the repertory of visual knowledge at the basis of formal configuration processes and, lastly, as a specific "tool" of the world of design. The way of producing knowledge through design has to do with the culture of representation, portrayal and production of images. In other words, visualisation constitutes one of the cognitive and instrumental abilities central to the education of a designer.

Visualising is a typical practice of those of design and there has been no lack of theoretic attention to this practice, which represents a veritable cognitive style.

Translating thought into pictures is a typical way of triggering design thought. But visualisation is also the most common way of communicating and sharing design thought.

Indeed, the different forms of representation – from open representation like the sketch – to closed and finite forms of technical-executive design, passing through all the forms that we know, graphics, story boards, photography and video, to forms of 3-D representation and the model, are all aimed at comparing and transmitting information, not using *verbal* language but a language made up largely of pictures where text, to use the words of Anceschi, is often used in caption form. This attention to visual thought has always been present in big issues relating to design but, above and beyond the transformation of the

media and relative languages, even in the specific world of design there are new facts that contribute to conveying new centrality to this theme in research into educational practices. I mention it briefly looking at a few contemporary research locations.

A first area of research works on the new complexity of the subject of design, the reference theme being not so much the visualisation of the physical qualities of the subject as the visual restoration of the value-related characteristics of the artefacts: visualising the sensorial, communicative and emotional qualities that, in the contemporary scenario, make up the determinant factors in the construction of the product and brand identity. Among other things, the enhancement of the intangible qualities of artefacts represents an important professional area in the world of product identity communication. In the crucible of experiences that goes by the name of *primary design*, Italy has, in some way, led the field in devoting considerable attention to these themes. However, the experimental nature of this intuition has not left an encoded knowledge that can be easily transmitted and used in learning practices.

It is a case of reviewing and completing the encoding of these experiences and arranging that system of reflections around sensorial aspects and the visualisation of qualitative aspects such as sounds, smells, flavours and tactile sensations that require other tools, for accompaniment and integration, to be restored and shared.

A second area of research linked to forms of visualisation is concerned with the fact that, increasingly, the subject of design is no longer just a physical artefact but the **scenario** consisting of possible future worlds where the product or products (where they exist) are just one of the elements that make up the visionary landscape of the designer who faces up, in this case, to the ability to implement new values, behaviours, methods of use, functional solutions and possibilities of service, moving in a design process where the design sphere is concerned with the need to restore intangible characteristics which have to find a way to be translated visually. And in this case too, there is a new professionalism, in the design of scenarios, between those working on product strategy and those who communicate. This area is undergoing considerable development. This area of visual experimentation includes, for example, the trend tables developed in the fashion world, containing visual, chromatic and material indications, which identify certain trends that will be used by designers later when they design the season's collection. These techniques, better known as mood boards, have migrated to other design spheres, such as the automobile sector for example. But I do not think that they gave satisfactory results when passing from 2-D to 3-D vision of the object. In terms of the products, there are also other ways to build scenarios: most people are familiar with the videos created by Philips design for the launch of new electronic products, a world in which new needs and new responses are often in demand, approached by the proposal of concept items which are launched on the market before the final product is actually ready. In these videos the reconstruction of the concept in which the product is placed is more important than the product itself. Stimulating a need rather than not providing an answer through a product seems to be the problem of these visualisations.

A third and increasingly consistent area of analysis and research investigates all the forms of visualisation that precede the moment in which the idea of design intervention becomes tangible. The pre-design investigations that often extend into the world of economists (such as sector, market and merchandising analyses), of marketing men (such as analyses related to corporate identity and values linked to a specific brand), of sociologists, anthropologists, ethnographic experts, psychologists and ergonomists (such as those relating to new forms of use and consumption, user analysis and analysis of his buying habits and use of the product, to the need to precisely define the micro context of use that derives in terms of type of use, etc.) need to be publicised with different methods aimed at the translation of design. The designers in these cases, even before they present their design ideas to the customer, are called upon to compare notes with the latter on the preliminary assumptions, on elements generated by the reading and interpretation of these details. In this case too, the method of visualisation of this part of the design process in such a way as to ensure that the results approach and evoke the main elements of the successive design is an issue of recent interest.

A final aspect closely connected to the others regards the fact that this complex system made up of intangible ideas, value-related aspects and tangible parts is part of an imagery which must be given shape, which is not and cannot be inside the designer's head, but must become a shared matter.

Sharing, making several players part of the process of debate and construction of the scenario takes on new importance. In other words, it is a question of working on forms of sharing solutions that are only partly tangible, that have to be understood by players who are often not designers (businessmen, institutions, technicians, economists, sociologists, etc.) who possess a rather restricted visualisation ability, and there is a need to represent/visualise these complex forms of knowledge in a new way to make them explicit.

Just a brief mention of the theme which, in my opinion, puts together these different researches. In all of them we can see how the representation loses its mimetic connotation (similarity to reality) to move towards the symbolic/evocative/allusive dimension.

In these researches, the interest is no longer linked to the form of analogical representation that reproduces the similarity with the content, relying on the principle of similarity. We are in a situation in which the principle of similarity alone is unable to have cognitive value.

Words and pictures in these dynamics often play the role of being the representation of something that really stands for something else. Here the evocative and symbolic aspect of verbal language and visual language form founding instances of sense and becoming dominant in the construction of a shared image of new models of reality.

And it is on this theme that research is working: what are the operating modes of symbolic images? For these themes, considerable importance is held by those studies which focus on the capacity of the image to reflect abstract concepts (just think of the different forms of visual

representation that have visualised terms such as time, space, sacred and profane in allusive terms, filling them with tangible significance) and the capacity of words to refer to tangible worlds, visual and sensorial references.

This report does not claim to thoroughly examine the capacity that research has in relation to traditional themes, but simply to highlight how design – an open discipline – is perhaps destined to keep open the areas of research that regard its practices and, among these, the practice of teaching, which plays a critical role in launching the foundations of this profession.

Reference

ABERCROMBIE, L.L.J. 2003. *Anatomia del giudizio operativo*. Milano, Franco Angeli.

ARNHEIM, R. 1979. *Il pensiero visivo.* Torino, Einaudi, 410 p.

BARA, B.G. 2000. *Il metodo della scienza cognitive*. Torino, Bollati Boringhieri, 379 p.

BONSIEPE, G. 1975. *Teoria e pratica del disegno industriale*. Milano, Feltrinelli, 239 p.

BONSIEPE, G. 1995. *Dall'oggetto all'interfaccia.* Milano, Feltrinelli, 261p.

BOURDIEU, P. 2003. *Per una teoria della pratica*. Milano, Cortina Editore, 338 p.

BÜRDEK, B. E. 1992. *Design. Storia, teoria e prassi del disegno industriale*. Milano, Mondadori, 391 p.

CARDINI, C. 1997. *Lo sviluppo dei nuovi prodotti.* Milano, Guerini, 294 p.

CERIANI, A. 1996. *La simulazione nei processi formativi. Una metodologia per un pensiero creativo progettuale.* Milano, Franco Angeli, 190 p.

GREGORY, R.L. 1991. *Occhio e cervello. La psicologia del vedere.* Milano, Cortina.

HOLTON, G. 1983 *Occhio e cervello. La psicologia del vedere.* Torino, Einaudi.

KANIZSA, G. 1980. *Grammatica del vedere. Saggi su percezione e gestalt*. Bologna, Il Mulino, 363 p.

LAZZARINI, G.; CUGNO, A. 1999. *Sfide formative in uno scenario in transizione*. Milano, Franco Angeli, 270 p.

LEGRENZI, P. 1994. *Manuale di psicologia generale*. Bologna, Il Mulino, 520 p.

LINDINGER, H. 1988. *La scuola di Ulm. Una nuova cultura del progetto*. Genova, Costa&Nolan, 287 p.

MALDONADO, T. 1974. *A vanguardia e razionalità*. Torino, Einaudi, 271 p.

PARISI, D. 2001. *Simulazioni*. Bologna, Il Mulino, 294 p.

PETRONI, G. 2000. *Leadership e tecnologia*, Milano, Franco Angeli, 182 p.

PIZZOCARO, S.A.A.; DE MOARES, D. 2000. *Design plus Research*. Milano, Politecnico di Milano, 540 p.

POLANYI, M. 1979. *La conoscenza inespressa*. Roma, Armando, 119 p.

ROGERS, E. 1983. *Diffusion of Innovation*. New York, The Free Press.

SARTORI, G. 2000. *Homo videns*. Roma-Bari, Laterza, 121 p.

SASSO, A.; TOSELLI, S. 1999. *La scuola nella società della conoscenza*. Milano, Mondadori, 279p.

SCHON, D. 1993. *Il professionista riflessivo. Per una nuova epistemologia della pratica professionale.* Bari, Dedalo, 367 p.

SENNET, R. 2009. *L'uomo artigiano*. Milano, Feltrinelli, 311p.

SIMONE, R. 2000. *La terza fase: forme di sapere che stiamo perdendo*. Roma, Bari, Laterza, 152 p.

TALAMO, A.; ZUCCHERMAGLIO, C. 2003. *Interazioni*. Roma, Carocci, 155p.

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