What are the educational models upon which young designers today are trained? What has remained of the training models of the past? Are there models that present elements of innovation and experimentation, and that question the modes and approaches of education established to date?
Does it still make sense to speak of training as belonging to Design, or is Design becoming a basic discipline in and for other training projects addressing society as it develops?
Making reference to the international scenario, issue 71 of **diid** intends to explore and give voice to those training experiences that, at design schools, are imagining a new approach to training – one more in keeping with a possible future that looks to be uncertain and still undefined, due to the incessant, rapid, and ubiquitous digital revolution that is proposing and experimenting with new models and styles of learning and knowledge.

Giuseppe Losco

Design 2030: Education

Yavuz Alastair Fuad-Luke, Mariagela Francesca Balsamo, Ambra Borin, Daniela Busciantella Ricci, Luisa Collina, Mirko Daneluzzo, Luigi Ferrara, Silvia D. Ferraris, Giuseppe Furlanis, Albert Fuster I Martì, Laura Galluzzo, Luca Galofaro, Luca Guerrini, Matteo Ingaramo, Salvator-John A. Liotta, Giuseppe Losco, Yongqi Lou, Francesca Mattioli, Davide Paciotti, Giulia Panadisi, Tonino Paris, Isabella Patti, Lucia Rampino, Chiara L. Remondino, Massimo Santanicchia, Sofia Scataglini, Manuel Scortichini, Jennifer Schubert, Andreas Sicklinger Paolo Tamborrini, Seçil Uğur

Design 2030: Education

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Design 2030: Education

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The central importance of training in the education of a young designer, since the rise of the first design schools at the start of the last century, has always been the object of significant reflections that have had a strong influence on the role, responsibility, and contribution of design to the development of the modern condition in contemporary society. The series of papers proposed in this issue aims, starting from the Think section, to contribute not only towards taking stock of the situation with the involvement of several authors representing various international outfits, but also towards trying to redefine the area's disciplinary boundaries, and towards indicating what are the prospects and lines of orientation that will lead design to a new future, and therefore to a new vision of a society undergoing major change.

Luisa Collina's paper emphasizes the need to overhaul first-level university degree courses, about 30 years since their initial activation at Polytechnic University of Milan, which for many students represented the first and fundamental entry of future designers into the professional world, in a profoundly changed global social context. The first reflection starts from the consideration that it is no longer enough to focus on learning as much knowledge as possible in order to grapple with modern-day complexity, but to prepare the future designer to do research, to be able to organize an always changeable design path, with which to approach and solve the problem facing him or her. Consequently, training will have to be characterized by a backbone of shared bases and by numerous appendices, appropriately oriented towards giving life to a consistent, recognizable profile in harmony with the individual student's aptitudes and interests. This type of learning will require deeply restructuring the current training, and its organization will have to establish forms and places of learning that are hybrid, broad, and customizable, ranging between the realities of traditional classrooms and the vast world offered by the enormous potential of the network transmitting and exchanging data on a planet-wide level.

Luigi Ferrara, on the other hand, emphasizes the necessity that, prior to any training action, in any field, there must be a perception and deep reflection on the world we live in and how it works. The acquisition and awareness – in the form of virtuous wisdom – of a mastery of human behaviours and of the physical environment, will be the right antidote for controlling and guiding the systemic interactions that are triggered. In design, this attitude of wisdom requires not only skills in various spheres of knowledge, but also the capacity to understand how these spheres are connected to and interact with one another. To achieve these objectives, new pedagogical tools different from traditional ones are needed. It is necessary to go beyond the skills typical of craftsmanship and of technical and professional knowledge, and to overcome the concept of design as the creation of new forms, only from the standpoint of aesthetics and of strictly functional, user-focused design, that humanizes technology. A designer's training will be directed increasingly towards acquiring skills that bring him or her to work within a collaborative design, within an ecosystem of specialists cooperating in an interdisciplinary fashion, who are able to converse and relate with neighbouring disciplines, in order to increase the productivity of their solutions.

Giuseppe Furlanis's paper describes the experience in Italy of the training courses in industrial design, which first came into being outside the university system, in strong collaboration with the nascent Italian industry. They followed in the wake of the Ulm School which, in comparison with the German (Bauhaus) and Soviet (Vkhutemas) schools arising in the 1920s, raised the need to endow the profession of designer with a scientific and academic character. Subsequently, in the early 1970s, particular attention developed towards issues of public and social relevance, which found their base of application in the higher institutes for the artistic industries (ISIA – Istituti Superiori per le Industrie Artistiche) which, while maintaining their experimental nature, had replaced the higher courses of industrial design (Corsi Superiori di Disegno Industriale) and the higher course of graphic arts (Corso Superiore di Arti Grafiche). The projects arising within the ISIAs introduced a new orientation into design teaching: the shifting of the main interest of design from the individual product to serving public utility, in which the designer was a technical intellectual with a major social role, responsible to the environment and to society at large. Today, on these principles and values, the designer's profession is being increasingly oriented towards a systemic conception of the project that requires possessing broad knowledge in order to be able to dialogue with specialists from different disciplinary settings and to coordinate high-complexity research as a function of their design application.

Albert Fuster Martì's paper, starting from the most important experiences of design schools over the last century, reflects upon how the curricula of a plan of studies must be strongly influenced by the relationships existing among the backgrounds of the academic communities (students and teachers) and the environmental and social setting in which one develops. The objective is to build an experience that, although complex, will be presented as unique, significant, and personal. The strong demand for training, and, on the other hand, a policy of educational offerings based on indicators and rankings, is orienting especially institutional offerings towards a highly rigid regulatory framework harmful to the creative process and the learning experience. The challenges that designers must currently face have a high level of complexity that cannot be easily dealt with by a single role. It is therefore necessary to connect the students' objectives to "real-world" experiences, and this cannot take place in a school conceived as an insulated, closed environment that offers exclusive access to equipment, knowledge, and experts, but one widespread on the territory, not limited to a specific building or campus, but open to societal cross-breeding in

order to expand in a design dimension that includes services, systems, and strategies. Salvator John A. Liotta's paper emphasizes the need to activate teaching pathways that have at their base the development of a project, concrete experiences, in such a way that design theory can be combined with design practice. This reflection starts from the fact that students are not always able to maintain the design consistency between the final result and the choices in terms of the structural logic and use of the materials of the artefact that they will develop. The possibility of building artefacts on a real scale, in an academic setting, has made it possible not only to translate theoretical concepts into physical realities, but also to try out new modes of teaching, like workshops or summer school, to supplement the traditional courses, allowing students to develop the structural conception, the appropriate choice of materials, and its construction.

Yongqi Lou's paper reflects upon the major transformations involving design, from a discipline mainly interested in style to a conception of thought capable of promoting positive changes in the economy and in society, starting from the major problems afflicting humanity globally. The evolution design has undergone was clearly influenced by the degree of technological innovation that has accompanied society's scientific progress, such as for example the progressive capacity for executing complex calculations. This aptitude, bound to take an interest in living beings, led it to becoming a unique innovation driver, a "strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences" (World Design Organization, 2015). The paradigm shift evolved design from passive supplier of optimized artefacts and services to a solver of major problems, thanks to its ability to propose systemic, holistic solutions that include "objects" and "services" designed in a shared fashion by a number of experts capable of embracing the problems in their complexity and of guiding society's transformation. To be competitive and equal to their role of social responsibility, design schools must align with these objectives as soon as possible.

The Make section reports a number of selected experiences confronting one another between the sphere of "pure" theory and the sectors of "practice," through the offering of new forms of aggregation and active, collaborative participation.

The section opens with the paper by Daniele Busciantella-Ricci and Sofia Scataglini, who propose a training model based on the theory of "Research Through Co-design" (RTC). This model focuses on the concept of "democracy of knowledge in design," and is based on the theory of control systems and on the mechanism of research through design as a cybernetic system of the second order. The co-design process, which is an integral part of the proposed model, is considered as heralding a neural network (brain) of the system that exploits democratic and inclusive processes, processes of confrontation and dialogue, based on collective intelligence and creativity. In this participatory process, people learn from one another and are able to produce new knowledge by contributing democratically to achieving an interest, a project, and a common objective.

The paper by Ambra Borin and Laura Galluzzo refers to the experimentation, based on Design for Social Innovation, of a didactic approach that is new from the methodological and design standpoint, characterized by the use of new digital and analog tools for the activities of co-design for virtual simulations and prototyping of the final design. The pandemic contingency has allowed them to trial a model for the future on a large scale, in which future designers had to show they were able to handle complex and innovative processes, work with other people remotely, and design and develop prototypes in real spaces scattered around the world but managed remotely. Possession of transdisciplinary knowledge acquired on the practice of co-design allowed imaginary and creative solutions that overcame the barriers of space and time to be proposed.

The paper by Francesca Mattioli, Silvia Ferraris, and Lucia Rampino invites reflection on the evolution of the didactic strategies that are being oriented towards teaching models that call for integrating forms of active learning in order to enrich the traditional structure of or "receptive" courses. These didactic activities involve the students in doing and thinking about what they are learning, and in solving the problem raised by the teachers using the design tool () exercised in a cross-cutting fashion with the teacher him/herself and the other students. This process acquired greater prominence upon the formation of classes or groups with a cultural diversity of academic and international preparation, especially when dealing with issues regarding global citizens.

The paper by Isabella Patti, in the wake of the more recent studies of Historical Simulation Games, concentrates on historiographic methods and on learning systems from the gaming perspective of design history. In this case, the simulation game serves to reconstruct, in a collaborative and interactive form, the comparison and practical application of historic data, known and yet to be known. The information that is obtained, with historical/critical investigations, mainly from the Internet, are used not only to narrate a historical account, contrafactual, based on certain and uncertain sources, but as an alternative model for learning history critically and reflexively.

The paper by Jennifer Schubert, SeçilUgur Yavuz, and Alastair Fuad-Luke proposes a framework of reference relating to the methodology for the design of procedural artefacts that are detached from the conception and prototyping of products for the market. They have inter- and transdisciplinary purposes; tend towards opening and towards raising questions, ideal in the collaborative mode of a design capable of facing uncertain times; and at the same time create a discourse and an action on likely, possible, and hoped-for futures. The mode of design of procedural artefacts brings together visions of the world, suppositions, and different ways of knowing, to call into question that which is normalized so as to challenge imperative social, conceptual, and ontological norms.

The paper by Paolo Tamborrini and Chiara L. Remondino aims to herald the overcoming of the designer's traditional, self-referential dimension, in order to promote new attitudes, methods, models, and approaches aimed at complexity. At the centre of

the learning of the design process is a process in which knowledge is created through a collective effort, with strong social responsibility, which must start to think in terms of complex systems, while explicitly valuing a multidisciplinary approach. The learning context takes place on an experiential basis that, in a dynamic and evolutionary form, finds activities like laboratories, challenges, workshops, or summer school where their experiences are reflected upon, recounted, and shared.

The Focus section, on the other hand, turns its gaze to the presentation of experiences, pilot projects, and good practices, in which the design and organization of spaces, of workshops, and of physical tools (digital and otherwise) are a fundamental part of and direct testimony to the teaching and learning methods, starting from reflections that update to a contemporary form the positive experiences of the past.

Luca Galofaro, on the other hand, concentrates on the definition for a new educational system of spaces, ideas, and tools quite different from one another. The design of the spaces of learning places and the objects for use populating them, both tangible and intangible, are a consistent part of a single, integrated system intended to redesign the space of knowledge. Underlying the contribution is the recognition of the theories of Cedric Price, who conceived a space of knowledge, not fixed and immutable, but updatable over time and above all spread not only in the classrooms and libraries set up for this, but also in the many different places that constitute the city and the territory. An educational structure that was constituted as a social service; an integrated system of objects and spaces that generated an environment in which to learn and live, would dissolve one into the other. The task today of those teaching design culture will be to rethink not only the structure of disciplinary content, but above all the places where they will be rendered explicit.

Luca Guerrini's paper describes the author's experience in the PhD programmes – tertiary-level education – in which the student, after the initial teacher-led guidance phase, is placed at the centre of the action and becomes a leading figure in his or her own training through his or her own capacity for dialogue, for raising proposals, for discussion, and for collective interaction with the other students, the teachers' board, and everything that he or she will deem useful on his or her path. On the pedagogical level, reliance was placed on Reginald Revans's action learning approach which, although arising in environments outside academia, "seeks to generate learning through the interaction among participants engaged in solving real cases." This methodology, involving behavioural, intellectual, and practical skills, will lead the researcher being educated to acquire a high degree of confidence, autonomy, and self-esteem.

Matteo Ingaramo's paper brings us on the other hand to the relationship between supply and demand in the designer's profession, between expansion and growing interest in design and new training tools and methods. The uncertainty of disciplinary and professional boundaries and the overwhelming use of new digital technologies leads the author to foresee a "de-culturation" of the traditional concept of design, without dissipating its original form, but integrating it and replacing it in a vision

in which specific, detailed skills are integrated in a multidisciplinary fashion using interaction and co-design technologies, including remote ones. Albeit in a different way, this process relates to two aspects of the same problem: basic training and professional development. The path that now seems laid out is increasingly marked by abandonment of a monolithic or individual approach, incapable of resolving complex problems. While the context of knowledge and practice constantly evolves, the process of updating and acculturation will take place in parallel, both through the capacity for a deeper analysis and extension on a theoretic and cultural level, and through the acquisition of ever-increasing design capacity for multidisciplinary integration, albeit by successive phases and steps.

Giulia Panadisi's paper opens reflection on the tools, methods, and processes for training in the digital era, and in particular the potentials of "motion design" in the setting of remote interaction and learning, and of design workshops specifically. Hybrid and dynamic, interactive procedures are not just a more effective tool of learning and communication, but can also represent a rethinking and a new way to approach the design process, since it can induce processes of integration among different strains of knowledge, and in particular between teachers and students. The design workshop is the natural place of experimentation of collaborative learning, for its inter/multidisciplinary nature and its character of collective participation, which functions only if, at the base, there is a shared and interactive relationship not only with the teachers, but among the students themselves. The preparation for a product in the form of "motion design" presupposes not only a knowledge of animation tools and techniques, but above all a creative design process that profoundly impacts the nature and quality of the product itself.

Massimo Santanicchia's paper reflects upon the role and participation of the designer – whether an architect or not – in public life, and upon the education that is at the basis of his or her training, which goes beyond the disciplinary acquisition of knowledge. The designer's education towards cosmopolitan citizenship serves to cultivate a strong social responsibility to take care of the common good. The scientific community devoted to training and sharing knowledge must aim to train not only professionals, but world citizens endowed with critical, rational, and empathic thought, capable of responding to and remedying important global like enormous social inequalities, the growing ecological crisis, climate change, and distrust of science.

The article by Andreas Sicklinger and Mirko Daneluzzo investigates the contribution – or better, the added value – that design brings, in comparison with the engineering disciplines, in the development of the design process, especially from the creative standpoint. "Form follows function" has become insufficient for representing the creative and emotional side of objects. Design has become a process rather than a definition of a form; it has become a service rather than a function, and its non-formal aesthetic lies in intangible values that reside not always in the physical object, but in its ability to surprise us, to impact behaviour and experience, to be transformative of a conforming reality.

Introduction

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The start of the 21st century is presenting itself with a strongly changed vision of possible future scenarios differing profoundly from those recently developed prior to the grave health crisis that has impacted the planet. Due to a frenzied and disordered thrust towards the globalization of goods and people, humanity will find itself, in a short time and in a different way, dealing with new needs, new requirements, and new necessities that lay latent or unexpressed during the last century. This will require additional rethinking and questioning on future modes of living and life styles.

The digital revolution that has asserted itself since the start of this century has created a strong break with the past. The transition from mechanical technology and analog electronics to digital electronics has prompted the introduction of new tools, technologies, and materials, and has profoundly changed the relationship between the environment, people, and the artefacts populating our daily life.

With respect to these considerations of a general nature, the world of design will also have to demonstrate its readiness to respond to and work on these challenges. And in particular, it will have to make a great effort in rethinking its capacity to educate, train, and instruct those who will have to exercise this profession. The underlying question that will be at the basis of this contribution will be to understand whether it still makes sense to speak of Design training, or whether Design is becoming a basic discipline in and for other training projects addressing society as it develops. This issue aims, with a forward-looking perspective, to begin to outline new visions and to set up new strategies on the role of design in the near future, having the awareness that the current arrangement, in its variants, found its raison d'être in the industrial revolution as a service to industry. The undisputed scientific and technological evolution acquired thanks to the impulse of the industrial sectors involved has been paradoxically accompanied by planet-wide setbacks in environmental stewardship and protection (the climate change effect), a widening gap in access to information and knowledge (the digital divide), and accentuated economic inequalities (distribution of wealth). This is having major effects on living conditions throughout the world. The complexity of the questions that are posed will then, to be solved, certainly require a new approach in managing them – an approach that can be no longer simple, linear, and deterministic as in the past, but complex, dynamic, and stochastic.

In its present state, design, although bringing together different knowledge, disciplines, and skills, and although representing a hybrid form in both content and languages, has on numerous occasions, in the places of training, taken on heterogeneous aspects of autonomy and self-referentiality influenced not only by the different territorial and geopolitical contexts and heritages, but also by the contributions of the academic disciplines, or of the professional world, or of the productive fabric it related with.

For this reason, Education, Training, and Instruction are headwords, that in their proposition indicate not only the traits of a specific field of knowledge of a discipline – with reference to its knowledge, its transmission, and its teaching – so much as the basis of reflection for a reconsideration of the role of design in contemporary society, and of the professional profile resulting from it.

As commonly defined, Education is the system – or, better, the set – of tools that a society adopts to form and guarantee the transmission of knowledge of a religious, cultural, technical, and scientific nature, and of the values it deems essential (Ph. Aries 1979). In this sense, education is aimed at developing and forming knowledge, mental faculties and social and behavioural aptitudes, and at extrapolating and strengthening qualities and skills that are innate but unexpressed in an individual, and highly conditioned by the environment where his or her personality is developed. In a traditionalist vision, this conception is seen, rather, as a means by which dominant groups maintain their superiority over the dominated. This highly conservative vision of education/transmission would in fact tend to oppose any change, condemning society to immobility. Fortunately, however, since society and the educational system are homologous entities, they register profound changes reciprocally and osmotically, albeit with some lag time.

In its history, education has in fact represented a tool of intervention for transforming society, and, among all the age classes, it has played, an important role in training in the scholastic field especially in the age class from childhood to the completion of adulthood.

The term "training," taking account of the difference in etymological meaning of education – "to lead out, to develop the subject's interior qualities"[1] and of the term used in Italian for training, "*formazione*," which means "to give form, to shape, based on an external criterion or design"[2] –, is the result of a learning process to give form to transmission, contribution and stimulus for personal growth. Training represents that set of pedagogical activities that are aimed at promoting the intellectual qualities of the person towards civil, spiritual, and moral education, at developing specific skills, at acquiring a technique or of a professional skill, and at preparing a person to carry out an activity, a profession, or much more simply, to live. Training will be all the more valid the more the subject is able to adhere to and take part in the educational "external project" that regards him or her. Rapid advances in all sectors of knowledge have made increasingly clear and urgent the existence of "lifelong learning" from a professional standpoint, throughout working life.

In Ancient Greece, the term *Paideia* (Ancient Greek: παιδεία, paidéia) indicated the pedagogical model in force in Athens in the fifth century BC, that referred not only to the school instruction of youths but also to their ethical and spiritual development,

in order to make them perfect and complete citizens: an elevated form of culture, an ideal, capable of guiding their harmonic introduction into society, and to be pursued throughout their lives vita (H.I. Marrou, 1950).[3]

Unlike education aimed at a socialization that is oriented and not bound to the transmission of knowledge but to the social distribution and reproduction of the individual, instruction is understood, rather, as a series of activities carried out through teaching, as pertains to the transmission of what knowledge, and for what reason it is transmitted (objects), who the recipients – teachers and learners – are (subjects), what are the preferably coordinated modes of transmission of knowledge, and in what training structures, in or out of school, they are exercised (modes). (F. Gil 1979).

The different hierarchical dimension of the three aspects, as seen by design, can only refer, then, to that great ideal tension that the culture of design, in its evolution, gas poured into the training of the designer, a professional figure that profoundly changed in the nineteenth century in relation to the transformations introduced by the Industrial Revolution under the influence of the *Gestaltung* movement of thought[4] in which the creation of forms, the aestheticizing and the functional, was influenced and determined, albeit in different manifestations, by economic and social factors.

In this sense, extraordinary importance was held by the birth of interdisciplinary associations of architects, artists, scientists, artisans, entrepreneurs, teachers and writers, like the Deutscher Werkbund ("German Artisans League"), followed by that of the foundation of training centres devoted to the development of creative activities and of the teaching of industrial design. The need to handle new content implied a transformation of practice and of aesthetic education. Industrial design takes on a new status: while initially it was an integral part of the work and technique of handicraft guilds or of the first engineering schools, now it was also the object of artistic activity. The soundest and richest ideas of the 1920s were developed in Germany by Bauhaus, School of Architecture, art and design in 1919, and in the nascent Soviet Union in 1920 by Vkhutemas, State Higher Art Workshops.

Although Bauhaus's artistic and pedagogical principles underwent profound changes between Gropius's foundation in Weimar in 1909[5] and its dissolution in Berlin as a private institution in 1933 under the direction of Mies van der Rohe who had taken the reins in 1930, it had, in the motto "Art and Technology – A new Unity," the principle by which the learning process could not be just taught, as in the usual art schools, but inserted into a process in continuous transformation and self-transformation, linked the concept of "learning by doing" that did not exclude "learning by reading."

In Russia, the merger between the Stroganov School of Applied Arts and the Moscow School of Painting, Sculpture and Architecture led to the foundation of del Vkhutemas, Higher Art and Technical Studios, where new artistic and design theories were experimented with, thanks to the research of those avant-gardes that, with exponents like Kandinsky, Malevich, Rodchenko, and El Lissitsky, and with movements like Constructivism and Productivism, left their mark on the culture of the last century.

In contrast with the classic rules imparted by the Academy, the two schools saw the elaboration of new conceptions, as well as new media and teaching methods that aimed to spur individual creative activity as opposed to the copying exercises on the use of manual artistic techniques, while accompanying traditional courses and teaching with theoretical ones on the principles of design, artistic composition, visual perception, industrial design, and the sciences of technology, economics, and sociology. The concept, later continued by the Ulm School, was to teach that the creation and elaboration of forms was no simple creative act, but a problem inserted into the context of sociocultural and technical-scientific changes, and the object of the modernization process itself.

The designer's training, initiated as a qualified trade devoted mainly to quality handicrafts for the creation of aesthetically beautiful objects of daily use, was transformed into a technical profession that has made a strong contribution to the development of many industrial sectors through its ability to interpret and translate the innovation needs of modern society. Now this role of responding only to human needs has evolved into something more complex in the way of conceiving and dealing with problems in order to improve not only human life and the quality of the work, but also the planet's overall state of health.

Most of the world's schools and universities are dedicated to organizing primarily the transmission of knowledge around questions connected to the artisanal abilities of drawing, materials, construction, production, and aesthetic finish, while neglecting something new and different from these abilities, especially in the field of the fundamental principles of the cognitive sciences, mathematics, and engineering that underpin the proper use of the technology contained in the produced objects.

This acceleration and change of pace in design's relationship with the complexity of the modern world has brought about, also in its professional figure of reference, a leap in quality from a simple albeit qualified professional tradesperson, able to have mastery of skills and of technical abilities, to an "intellectual technician" suitable for developing the specific design interests connected with the culture of manual and intellectual "facticity," in accordance with an interest no longer limited only to the relationship between form and function out of the pure rationalist tradition, but also to the productive and environmental context in which he or she operates. This figure of the designer is suitable not only for defining spaces and objects, but also for indicating choices and paths that ensure a better balance between liveability and innovation in the human habitat.

The transformation from analog to digital with the introduction of computing and processing systems, the spread of communications networks, the creation and processing of databases, and detection and interaction systems have made common everyday devices more complex, endowed with a hidden and invisible intelligence that have made their operation more complicated for common people. In a short amount of time, we have had to update and inform design with the technological know-how that is at the basis of understanding, operating, and using these new devices, not

only by making them understandable and usable, but also by connecting them with linked systems and services. The designer not only develops these understandable and usable tools, but broadens their function through the development of a higher-level service: not a physical object but one of interaction among people, things, and real and virtual spaces. This type of design will require a type of approach different – in method, knowledge, skills, and abilities – from traditional product design.

The introduction of new knowledge linked to the sciences dealing with cognitive processes (information and communication), human behaviour (human factors), interaction between individuals, living environments, and technologies (ergonomics), and information technology have required redefining the foundations of design, and rapidly updating knowledge, disciplines, skills, and abilities. The new forms of design that have been constituted on these bases have seen the involvement of designers, experts in other sciences, customers, suppliers, and producers, in accordance with the method that starts with "defining the problem" and then subsequently goes on to "solving the problem," through a systemic, structured, integrated, and iterative design. The activation of the continuous experimentation process based above all on analyzing the users' experience is verified with evidence, validations, and assessments that are for the most part comparative, thereby allowing a diversity of prospects and solutions to be examined.

The training action will not be only in the setting of acquiring professional skills and techniques, but will be structured in accordance with the methods ushered in by scientific research in order to create, discover, confirm, and review convictions, values, and ways of thinking. The produced research will contain new thinking and new knowledge; it will be shared with others, experts and non-experts alike, in order to demonstrate how they can be developed, applied, and used in new situations. The acquired intellectual ability will, in natural fashion, allow knowledge to be transferred from one field to the other, and models to be applied and connected among the different domains. It will permit durability over time and resilience to change, obsolescence, and contingent adversities.

Training linked to handicraft skills capable of adding value to products and services will no longer be sufficient to design the objects we use in homes and at places of work or entertainment; the designer of future generations will instead have to be able to increasingly take on a role as leader in designing through a preparation capable of explaining, interpreting, and managing new visions of the future – creatively and well in advance.

A new way of thinking will have to guide those who will be leading the design schools of the future, where an understanding of the complexities of the world, with its environmental, social, and economic questions, will have to be accompanied by the exploration and learning of the human, social, and applied sciences, in such a way as to allow design to be constituted as a way of thinking and acting, an element of interface among people and technologies, and also for the management of creative and innovative processes in the real world.

In the pedagogical learning process, the study of the problems' complexity will not be only a question focusing on the objects' "form and function" in accordance with a scalar dimension, but a question linked to implementing a methodology, on the level of system of thought, dealing seriously, rigorously, and in a transdisciplinary fashion with the needs and requirements of people, the environment and context in which we operate, the process of planning, developing, and producing the design, tools, methods, and processes for assessing the expected results.

This path will guarantee the production of new knowledge that will enrich and augment the set of experiences of the participants in the design, in an interdisciplinary work. Dialogue with other disciplines will help towards understanding the limits of one's own knowledge, opening collaboration relationships on existing research, comprehending their research methods, and advancing new partial or unexplored levels of research – and all the more so if the design is complex or requires levels of advanced planning.

New horizons will also open in the training activities that will evolve towards new forms of participatory learning (learning by doing and by using), which will join the more traditional ones like classroom teaching (*ex cathedra*) and "learning by doing."

Of course, the disciplinary field of design has expanded considerably, although the industrial design of products and communication is still the discipline's mainstay. In recent years[6] this path has been joined by others that have been directed either towards new specialist design methodologies, or towards paths of deeper specialist analysis of products that in their turn have produced additional specialization sub-fields.

In the final analysis, if we accept H. Simon's generalist definition that "Design is any strategy aimed at changing the existing situation into a better one" (Simon 1973)[7], the work to be undertaken will be that of defining the features of this professional figure who carries out an intellectual activity that unites the conceptual and creative dimension with the dimension of doing and using, in ongoing processes of knowledge and innovation. This figure's interests in designing visions and scenarios of the future, real and virtual spaces and environments, strategies and interventions, processes and products, services and systems conceived for all sectors of production of consumer goods, thanks to his or her ability to interpret and foresee human needs and transform them into material and immaterial artefacts designed to improve life and social relationships, will have to find in the training plans not only the subjects and lessons of reference, but above all his or her philosophy[8] of application.

[1] Heading: *educare*, intensive form of *educere* "to draw out, to raise" compound of *ex ducere* ""to draw, conduct", *Piccola Treccani*, 1995.

[2] Heading, formazione, *Piccola Treccani*, 1995.

[3] "*Paideia* is a process that is spiritual and institutional, ideal and material all at once, and that is developed in a close, unitary game between the two aspects or elements, while looking in the direction of a universalization of humankind well manifested in the Latin concept of *humanitas*". Henri Irénée Marrou, *Storia dell'educazione nell'antichità*, Roma, Studium, 1950

[4] *Gestaltung* was a movement of thought in the 1930s, which gave rise to the psychology of perception and to the modern cognitive sciences.

[5] The Weimar institution was first closed in 1924, and was then transferred to Dessau in 1925, again under the initial guidance first of W. Gropius, then H. Meyer, and then Mies Van der Rohe, who closed it in 1932.

[6] For more analysis, see the part "*Nuove forme del design*" in: G.Losco, *I caratteri distintivi della modernità nella cultura del design*, Rivista diid n. 64, 2018

[7] Herbert Alexander Simon, a United States economist, psychologist, and computer scientist, who was awarded the Nobel Prize in Economics for his "pioneering research into the decision-making process within economic organizations " in 1978.

[8] "The set of principles, ideas, and convictions upon which a person or a group of persons base their conception of life."

References

> Ph. Aries, Voce Educazione, Enciclopedia Einaudi 1979
> F. Gil, Voce Istruzione, Enciclopedia Einaudi, 1979
> Formazione, Istruzione, in Treccani.it – Vocabolario Treccani on line, Istituto dell'Enciclopedia Italiana.

> Henri Irénée Marrou, Storia dell'educazione nell'antichità, Roma, Studium, 1950
> Simon H., (1973), Le scienze dell'artificiale, tr. it., IT: ISEDI

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How will we teach in the future?

The first university course of study in design in Italy started in 1993 at the Politecnico di Milano. Subsequently, this path was redesigned in accordance with the "Bologna system", which came into force in the academic year 2001/2002. Almost twenty years have passed since then. Degree courses have multiplied or merged, depending on the different situations, they have progressively changed through numerous micro-adjustments, mainly dictated by contingent reasons.

Today, a significant need has emerged to reconsider the training paths offered in relation to the undergoing processes of change, and it focuses in particular on the three-year degrees which constitute the first and fundamental entry in the world of work for future designers.

This need, to evaluate and possibly intervene on the courses in a structural way and not only punctually, appears today as urgent as ever, since the pandemic has deeply impacted the academic world by triggering processes that could be guided, if the academic community has the capacity, but which cannot be made irreversible. Some of the appropriately articulated questions of this document are intended to guide a possible process of collective reflection on the possible transformation of design teaching in our near future.

[training, knowledge, soft skills, blended learning]

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"The New European Bauhaus movement is intended to be a bridge between the world of science and technology and the world of art and culture.
It is about a new European Green Deal aesthetic combining good design with sustainability. The New Bauhaus is about bringing the European Green Deal closer to people's minds and homes. And making tangible the comfort and attractiveness of sustainable living. Good design can improve lives.
The New European Bauhaus will demonstrate that the necessary can also be beautiful."

On October 15, 2020, the President of the European Commission Ursula Von Der Leyen introduced, in presenting her proposal for a "renewal strategy" in the Green Deal context, the key idea of a New European Bauhaus: a systemic transformation project and a bridge to link the worlds of science, technology, culture and art.

The President focused on the value of interdisciplinarity and on the possibility of a new aesthetic capable of combining design and scientific skills and of bringing the Green Deal closer to people, to their minds and their homes.

Referring to the forefather of contemporary design schools in a political message, within the contemporary emergency framework of the pandemic, is a significant event that may lead us to some reflections. First of all, the need for reconstruction is evident: to reshape the industry, institutions, cities and territories that surround us from a more sustainable perspective, but also to give shape to a new daily life of individuals, more respectful of the environment and "healthier" and "cleaner" in extended terms and not just sanitary. Secondly, and perhaps unwittingly, this reference focuses on a school, "the school" par excellence of international design, implicitly placing the emphasis on the importance of training, planning, multidisciplinarity and multiculturalism; but it also focuses on the development of critical thinking. These are all values intimately linked to the Bauhaus model.

Therefore, dedicating an issue to the designers' training in such a context appears to be very relevant and necessary, especially in a moment such as the present one, characterized by crisis, disorientation, fear and uncertainty towards the future; a context of global emergency that has highlighted the fragility of the entire globe and the general unpreparedness on how and with what skills to deal with such calamities. Thinking about the evolution of the education of design graduates also allows us, in these particularly difficult days, not to remain imprisoned in the constricting meshes of the present; we are obliged, both individually and collectively, to turn our gaze "beyond", towards the future: towards the future of thousands of young people who will make design their profession and towards the future of our planet that will be partly shaped by their planning.

Hence the choice to contribute to this issue of DIID dedicated to training by giving space to reflections, reasoning, experiences and future foreshadowing in a broad and diversified way, stimulating the sharing of good practices, but also of errors and failures to face our future as a scientific community. Hence also the inten-

tion to open the boundaries of the debate both in disciplinary terms and from a geographical point of view, by inviting some international colleagues to bring their own testimonies and suggestions.

A path started in the pre-Covid era
Personally, together with Francesco Zurlo, as Principal and Vice-Principal of the School of Design of the Politecnico di Milano, for some years now, we have set ourselves the goal of thinking about degree courses, in particular the three-year courses currently offered, for to understand if, after a few decades from their conception, these were still fit for the time and capable of responding to the objectives they had set.
Some changes that have been taking place for years are, in fact, strongly undermining the foundations of training in general and bringing out questions, doubts and new working hypotheses.
Among these we can include: the challenges inherent in social and environmental sustainability (well summarized in the 17 sustainable development goals defined by the UN), which require new complex and articulated responses that transcend geographical and disciplinary boundaries in an increasingly connected world; the socio-political trends that see a progressive polarization of global competition to the detriment of an increasingly marginal Europe, placing its universities in a secondary position compared to North American and Chinese institutions; digital technologies, increasingly evolved, necessary, but also pervasive, which profoundly modify our bodies, our daily lives, our relationships with the - close or extended - context in which we live and requiring continuous and new type of technological, but also ethical and human centric, planning. In addition to these global challenges, in our field of action we are witnessing a progressive distrust of "experts" and of the places, such as universities, where these experts are trained. In communications via social media, the expert's opinion weighs as much as that of a neophyte to the topic of discussion, just as the charisma is very weak and evanescent. As Chris Andersen stated in 2013, "*Our sons and daughters are studying at university. My grandsons and grand daughters may not* ". Following his book *Free: The Future of a Radical Price* (2009), in which he examines the rise of market models that provide free products and services to consumers, Anderson looks at universities, particularly American universities that require high tuition fees and are not very accessible to most people, where campuses are increasingly similar to luxury resorts rather than places of study and training, appearing as institutions with an uncertain future.
Recently, in 2017, a report dedicated to the impact of emerging technologies on society and work in 2030, published by Dell Technologies together with the Institute for the Future (IFF), reports the widespread opinion according to which experts *"estimated that around 85% of the jobs that today's learners will be doing in 2030 haven't been invented yet." And those new job demands "will seriously challenge traditional [learning] establishments."*

This vision of great uncertainty, which indirectly marginalizes the role of universities in the preparation of future professionals, was recently refuted by Derek Newton on the pages of Forbes with an article entitled "*The Myth Of Jobs That Don't Exist Yet*". While highlighting the groundlessness of the previous statement, the author nevertheless highlights the mutability of future professions and the need to equip students through knowledge of solid foundations and soft skills ("*And to the extent that any future jobs are in transition or under development, schools and students alike are wise to invest in foundations of a good education, the soft skills of the liberal arts such as critical reading, communication, creativity and collaboration* ").
Starting from this framework, both globally and more specifically in relation to the academic world, it has now seemed urgent to analyze the training courses currently offered in the field of design at the Politecnico di Milano, and to question the possibility and need to make changes, adjustments, maintenance o complete rethinking in some very broad areas: from the adoption of more current pedagogical models in tune with the way of thinking, learning and communicating of the new generations to the identification of the basic knowledge and skills for training today the youth to face the challenges of our very uncertain future.
With this in mind, we invited the members of the Advisory Board of the School of Design, selected experts from the world of the profession - Edgardo Angelini (Design Group Italia, Milan), Fabio Di Liberto (ISKO), Odoardo Fioravanti (studio Odoardo Fioravanti), Luisa Finocchi (Mondadori Foundation), Daniela Mainini (Centro Studi Grande Milano and Anticontraffazione) and Michele Rossi (Park Associati) - to reason with us, moving from some key questions, the answers of which constitute the presupposition for future designs and proposals.

The first question concerned, in general, the training model. The one conceived more than 20 years ago was based on the triad of "knowing", "knowing how to be" and "knowing how to do". On the one hand, these three concepts still show up to date, highlighting the need to build solid knowledge bases, work on the formation of the person and engage not only the dimension of thought, but also that of experimentation. In fact, learning processes today are guided not only by the acquisition of knowledge, but also by the development of "soft and smart skills" as well as by "doing" or by getting involved by experimenting, possibly even failing and trying again.
From another point of view, the original triad is today not very responsive to the breadth of disciplinary fields and to the complexity of challenges to be faced, from digital to sustainability (social, economic and environmental). Thinking that one may "know" everything that is necessary to tackle a project seems impractical and almost naive. "Knowing how to research" perhaps appears more contemporary, thinking of a designer who knows how to question himself and set up a design path and who, like a bricoleur, knows how to build the tools with which to face the complexity of the proposed theme. In this regard, the bricoleur profile highlighted by Claude Lévi-Strauss in his text *La pensée sauvage* appears to be very adequate: of a fervent, but at

the same time reflective, initially retrospective professional who observes his already pre-established set of tools and materials in order to "make and redo the inventory, and finally, above all, engage with it a sort of dialogue so to inventory, before choosing one, all the possible answers he can offer to the problem that is posed" (Lévi-Strauss, 1962). The second question concerned the identification of training objectives and can be summarized in the following terms: generalist approach versus specialization? That is, do we need to train people with solid and broad foundations or professionals ready to enter the market effectively and immediately?

In the past, there seemed to be a sort of implicit pact between academia and the world of work, such that the university could concentrate on the fundamentals of disciplinary knowledge by delegating to professionals, through internships and other similar experiences, the task of bringing in young graduates and undergraduates into the practice. Today, this pact seems to have crumbled in the face of professional realities often under pressure, which need figures who are already prepared for the job that will wait for them and who can no longer afford the width of the insertion times of the past.

From the opposite point of view, the world of work seems at the same time to reward solid but not specialized figures, who combine a good basic approach with broad views and the ability to face multiple and complex problems and challenges. How important it is therefore to persist in training designers in the different fields of the discipline (product design, communication, fashion, interiors, interaction, for example) and how much, instead, would it be more profitable to build broad, hybrid and customizable profiles that intersect the different branches of design? From this point of view, a hypothesis can be represented metaphorically by a comb, characterized by a backbone of common bases and by numerous appendices chosen by the individual student (appropriately oriented in order to create a coherent and recognizable profile), in tune with their own attitudes and interests.

The third question concerned the training modalities and went into the merits of its times and places and of many more specific aspects that have a significant impact on the training project.

The first concerns at what "speed" we want to set up the learning process.

How much does this have to adapt to the now frenetic pace of the profession or how much, conversely, can it constitute one of the rare moments of slowness in a lifetime, in which reflection, deepening and sedimentation of knowledge are privileged? How much do you have to train the readiness to react and the ability to compete with project constraints (one of which is always linked to the scarcity of resources, including time) and how important it is to train future designers in "protected" spaces with reduced complexity and more dilated rhythms?

With regard to the temporal sequence, one wonders whether it is still relevant to think of a linear training that progresses gradually according to a pre-established sequence, or whether it is more effective to think in terms of an open shelf, where the

student faces problems by equipping himself with the tools and knowledge required to identify the possible solution.

The traditional approach to technical-scientific training involves a linear learning path of the first type, whereby applications follow the basic theoretical and methodological knowledge. Today, on the contrary, we are witnessing the loss of the temporal and sequential dimension of the arguments in favor of didactic modules that can be used at different moments of the individual training path. The same training course has extended along the entire span of the existence of individuals, accompanying the life of individuals with a discontinuous trend in terms of both intensity and duration of training commitments, but with a certainly not secondary role even in mature age.

The sources of these training modules have also expanded and diversified. In fact, if the traditional approach entrusts the university, and the university only, with the role of producing and transferring knowledge, today we are witnessing open and hybrid systems, where the availability of easy-to-access digital teaching modules (MOOCs, SPOCs) offered both inside and outside academic contexts is multiplying, delivered traditionally, in presence, and/or remotely with both synchronous and asynchronous modes.

A highly customizable model of indefinite and configurable training paths emerges, which combine freely and without a pre-established sequence, experiences and highly diversified educational modules in terms of themes, approaches, quality, etc.

The teaching places evolve, expand and hybridize between real and virtual, between face-to-face and remote teaching, combining traditional lessons with guests and contributions from other parts of the world, pre-recorded videos, activities to be carried out in teams and individually, hands on or entirely via device. Traditional classrooms are gradually equipped with technological infrastructures in order to integrate the training dynamics of the classroom in a virtuous way with the contemporary ones offered by the network.

Beyond the perimeters of the classroom and individual campuses, the geographical boundaries of training extend. This takes place thanks to the evolution of mobility programs and the consolidation of partnerships capable of offering itinerant courses, in which each university offers its own specificities, creating attractive and stimulating interaction. The *European Universities Initiative* calls, launched in 2019, constitute, from this point of view, the most advanced and ambitious initiative: the intent is, in fact, to innovate the European educational landscape through the establishment of European university networks aimed at training the new generation of European creatives to face global challenges by working across different cultures, borders and disciplines.

In the current Covid and post Covid era
These reflections, initiated through the three questions referred to today, seem essential and further amplified in front of the recent picture of a world (and a university) that has dramatically and suddenly changed.

In fact, we have witnessed, for example, an incredible acceleration in terms of digital transformation, which was unthinkable just a few months earlier. Many universities

and schools have equipped themselves with all or part of distance learning, looking for new ways to offer experiences that were once very "physical", such as instrumental laboratories and internships, prototyping activities but also orientation ones. Today, some international universities of absolute prestige have announced that they will remain at a distance for the entire academic year, beginning to undermine the conviction of the need for physical and repeated contact between teacher and student and between students. Other universities have embarked on more complex "blended" paths. But what will the future post Covid look like from this point of view? How long will last the so-called "cave effect" that have already caused many students to decide not to move to follow the lessons as off-site in the various university cities of the world, preferring to stay at home and follow courses at a distance? In looking to a "new normal" future, it is essential to start over from the two teaching methods (in person and at a distance) trying to devise new ways to integrate and give value to both experiences, making them interact in a synergistic and harmonious way within a compound training path.

Finally, with regard to the training model, we feel the urgency to add a further term to the original triad of "knowing", "knowing how to do" and "knowing how to be", or "knowing how to resist", considering the very current need of future designers to be resilient, able to adapt and react to the changing environment with balance and perseverance. How the university can teach this ability and attitude, it is all to be planned.

References

> Andersen, C. (2009). *Free: The Future of a Radical Price*. Hyperion.
> Lévi-Strauss, C. (1962). *La pensée sauvage*. Paris: Plon. trad. it. di Paolo Caruso (1964), *Il Pensiero Selvaggio*. Milano: Il Saggiatore
> Newton, D. (2018). The Myth Of Jobs That Don't Exist Yet. *Forbes*, 28/12/2018, https://www.forbes.com/sites/dereknewton/2018/12/28/the-myth-of-jobs-that-dont-exist-yet/#1a3880da70ec

> The Institute for the Future (IFF), Dell Technologies, Emerging technolgies' impact on society & work in 2030, https://www.delltechnologies.com/content/dam/delltechnologies/assets/perspectives/2030/pdf/SR1940_IFTFforDellTechnologies_Human-Machine_070517_readerhigh-res.pdf
> Schnapp, J.T. (2013). Knowledge Design: Incubating new knowledge forms / genres / spaces in the laboratory of the digital humanities. Herrenhausen Conference *(Digital) Humanities Revisited – Challenges and Opportunities in the Digital Age,* 5-7.12. 2013

Think

On an Education for the Wisdom Economy.
Six key practices that enable designers to keep learning.

This paper describes how design education needs to be revisited to align with the emergent need for a wisdom economy that will enable the resolution of complex societal challenges which have resulted from the wicked problems of the global village. The new form of design practice needed in the future involves inter-disciplinary collaboration and the development of evolutionary, generative and systems design paradigms that allow designers to work together in creative collaboration with inter-disciplinary teams, stake holders, end users and soon with multiple intelligences and types of intelligence to create solutions that transform and evolve with time.

To achieve this new reality a new design education is required using integral thinking. The paper covers six key pedagogical practices that I have evolved and experimented with at the Institute without Boundaries and the DXNet both of which were experiments in overcoming the 20th century sequential specialist model for design.

Inspired by Calvino's Six Memos for the Next Millenium, I describe the six practices I have been using for the last three decades to paint a picture of a possible new design curriculum that responds to the deeply complex and interconnected immersive and hybrid worlds we live within. These practices lay a foundation that allows designers to manage synergistic interactions between systems to create better futures for the many species and forms of intelligence that will occupy our hybrid world. The frameworks and tools are intended to enhance wisdom and sharing of our worlds.

[complexity, collaboration, pedagogy]

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As the systemic challenges society faces drive complexity resulting in daunting and consequential problems, the need for wisdom in decision making is key to the continuity of cultures and species. Moments of threat, such as the COVID-19 pandemic, highlight the many "invisible" tendencies which our civilization has been exhibiting. Patterns of behaviour, whose consequences we are not always aware of, are suddenly apparent when we are forced to change behaviour. In addition, our changed behaviours, for example,not driving during the lock down, reveal that our air pollution levels would significantly diminish if we stopped our previous behaviours; reinforcing what weal ready knew but were slow to change. In these pivotal moments, we can observe our world and look for better patterns.We can study these new patterns, comparing and contrasting them to older ones to achieve knowledge and understanding. Most importantly we can appreciate how critical it is to explore and experiment so that we can learn the most from our activities and propose better habits. This process of thinking, making and reflecting gives us a deeper sense of our world and how it functions. It fosters a wisdom that enables us to make decisions about the consequences we want for ourselves, our society and the generations that follow us.

Wisdom, often considered an elusive term, is fundamentally about reaching a kind of mastery of ourselves and our environment so that we can control and or guide systemic interactions creating positive outcomes for ourselves, our families and society as a whole over time. Wisdom requires us to have mastery of various specialized domains of knowledge, but also to better understand how these domains are connected and interact with each other. This knowledge of how systems come together in synergy to create better impacts for people are not so common. Having wisdom enables us to design a better version of how our world is shared between us. It is one of the most powerful tools humans have to be able to design effectively creating the systemic interactions that are needed to move societies forward. In this sense, wisdom is the "fuel" that energizes designers to create solutions that improve and complete the lives people live.

During the pandemic, and in the period before the pandemic, our globalized society hurtled towards dangers; political, environmental, technological and economic. The need for a different approach to design education that would foster new generations of integrative design thinkers capable of complex problem solving with the ability to implement comprehensive innovative solutions to global challenges grew stronger than ever. A next evolutionary step in our educational systems is needed to train young talent with a new approach to design, one that would no longer just identify and analyze problems and bring solutions to market rapidly but that would train people to work within a framework that prioritizes wisdom such that designers would for instance not only stop the spread the pandemic now but improving systems help prevent recurrences in the future. During the pandemic we learned that countries who proceeded with wisdom reduced the impacts of the pandemic and generated a quicker economic recovery and that those that did not.

They increased negative impacts and created toxic problematics.

The pandemic has shown us that we need to keep learning;to practice cycles of thinking, making, synthesizing, adopting, reflecting and adapting for success. Traditionally, our society learned in a somatic way building upon experience and understanding through our bodily senses. Through a type of osmosis, knowledge and skills could be codified into conventions that we all could adopt.

Repitition from observation lead to mastery. People became skilled avatars of know how handing down knowledge over time. Generational practices of oral wisdom were expressed in their noblest form through the sharing of craftsmanship and its underlying "sensorial" literacy.

With the development of numeric and written forms of literacy, specialized knowl-edge domains could be developed that were extended into media that was retrievable and learnable using processes such as reading, writing, testing and grading. Over many generations externalized bodies of knowledge could be accessed, transferred and shared through an education system based on a process of increasing special-ization and knowledge accumulation. This enabled a society that used abstract tools such as money that provided exchange between specialist actors who could be sequentially coordinated to deliver societal goods increasing productivity through exchange and commerce. The resulting "abundant" society with complex processes of interaction increased life span and distributed resources and possibility to many more members of the society.

Today, this complexity is augmented by radical processes of digital dematerialization and re-materialization. In response our society is moving towards a more continuous form of exploration, experimentation, production, optimization and harmonization which allows us to better distribute and scale our resources while maintaining an overall equilibrium so balanced and creative evolution can take place.

Learning is moving toward an emphasis on research and exploration, using visuali-zation, prototyping, simulation and monitoring of our world in an effort to discover more equitable and appropriate formats for living. This requires integral thinking and the capacity for integration of systems into meta-contexts to better translate intentions into results. People, generally and especially designers, are being asked to better predict and create evolutionary flows between the material world and its immaterial agents. Design as a subject matter moves from the practice of making things that allow our lives to be shared to making the processes by which we interact with each other as we keep redesigning and reshaping the world.

Design schools need to move from teaching about how we know something, to how we come to know about many things and more importantly to know more and more about knowing in general and paradoxically about how we can generate new ways of knowing. Through this transformation we will be able to move beyond just living in the world of conventions as craftsmen, beyond a world of solution providers as designers and technologists, to a world where designers guide evolution as catalysts of generative creation.

In my career, I have participated in two key design education innovations, the DXNET, Canada's broadband network for design and innovation which I created at the Design Exchange and the Institute without Boundaries(IwB), an innovative educational program and think tank developed at George Brown College which I have overseen for nearly two decades. From these experiments I formed an outline of a design curriculum that responds to 21st century needs. During my time at DXNET and then at GBC I have experimented with six key practices that I believe lay a foundation for the emerging educational paradigm in design. They include:

- Interdisciplinarity interaction that synthesizes and shares domain knowledge and divergent methods for problem analysis and solving.
- The understanding and use of design levers to strategically design product service systems by asking the who, what, where, when, why and how of a design.
- The use of a charrette methodology to foster co-creation and align all significant actors around collaborative creation and decision making so that actions can be coordinated over time.
- The understanding of design as part of an ecology of innovation that must be coordinated and harmonized for innovation to take root and hold.
- The use of temporal frameworks and time-lining to reflect and meditate upon for inspiration in the design process and to gauge whether one should create geno-typical and or phenotypical solutions through a wholistic evaluation of designs in their temporal context.
- And finally think-making as a process that reinforces a "consequential" under-standing of the link between design intention and design effects and impacts.

All these pedagogical tools lead towards a stronger intuitive way of designing that generates wisdom over knowledge. These design practices move us away from our traditional cultural paradigms where we told stories and represented the world and even further away from our modernist cultural approach where we understood and controlthe world by breaking it down into abstract components that could be replicated into new creations. This approach lead usto an emerging cultural paradigm where we balance and interact in a world composed of multiple intelligences that are continually in evolution, a world that is scalable vs a world of economies of scale or simply of human scale.

In this paper I briefly describe these six key practices to help paint a picture of what the new design curriculum should include as we move towards an immersive paradigm that sees us living not only in the "real" world, or a "virtual" world but in an hybrid environment composed of many worlds ofdeep complexity.

Designers, in this century, are being called upon to deliver strategic solutions that go beyond the typical craft and knowledge based skills that they have been valued for such as form making, aesthetics, user centric functional designthat humanizes technology and finally decisions related to production and or technical excellence. As products, communication and environments have increasingly become part of "product service systems", supported by digital platforms, information technology

and physical networks of touch points that include aspects of communication design, industrial design, interior design, landscape design, architecture, engineering, service and organizational design, the need for a strategic approach to design has increased demanding skill sets typically associated with management science. More importantly designers need to understand systems thinking and system architecture to deliver solutions to clients that are comprehensive.

The initial response to design complexity was to develop interdisciplinary practices so that clients' needs for integrated solutions could be met. Over time this evolved into a virtual consortia with an ecosystem of specialists who collaborate on a consistent basis and who understand the need to work in an inter-disciplinary fashion. A fundamental part of a designer's education will require them to understand other related disciplines and their role in the design process and also to be able to converse, relate and collaborate with unrelated disciplines to enhance the productivity of solutions. They must be open to working with others and must develop a collaborative design etiquette. Moreover, they must they must be willing to co-create with end-users and stakeholders and gather more strategic input into an evolutionary design process. They need to be able to work synchronously and asynchronously and both lead and follow as required by a project's parameters. In my experience these skills are not currently commonly taught. In the last century designers were driven to specialize and to justify the value of their particular expertise over those of others rather than recognizing the benefits of working in tandem. In education the idea of breadth in design was confined to making students take courses from the liberal arts to expand their knowledge and increase their critical thinking. This approach has had little impact on true breadth of capability or made design students more collaborative. Studying and understanding other people's knowledge domains creates a basic level of dialogue for interplay. Instead of taking general education courses, actually having students from diverse disciplines spend time working together and learning from each other creating projects from inception to completion builds a new superpower, that of collaborative creativity. This new power allows designers to become an influential member of a creative team. Rather than whining about how organizations misunderstand design, it provides them the tools to respect and engage with their counterparts in way that will enhance their value on a team and position them to work successfully. There is no better way to teach breadth to students then to engage in interdisciplinarity creation and problem solving.

The design levers, as we teach them at the IwB, borrow fundamentally from the precepts of journalism seeking out the why, who, where, when, what and how of a design challenge. This technique,which I have consistently seen entrepreneurs use to evaluate business deals, can be taught to designers as a way of analyzing designs and playing with their fundamental characteristics. It allows designers to imagine totally new designs (genotypes) or to vary existing designs (phenotypes) to better serve changing needs. The design levers help you better understand how the target market should influence a design, how you should locate it in the city, whether to provide accessibility and diffusion or to concentrate it strategically. It helps you assess the fundamental value of your proposition, its permission space and how its value might change over time and place. Becoming conversant with the design levers creates a generation of designers who can dialogue with their clients about the key issues that their businesses or organizations face; not just about functional or aesthetic choices that are often not at the crux of solving a client's key dilemmas.

The use of the IwB charrette methodology which involves whole system thinking, interdisciplinarity, co-creation and community engagement to train students in collaborative practice is perhaps the most important building block for a re-imagined design education experience. Rather than having designers work by themselves on imaginary projects without real clients and without the typical members of the consortium ecosystem that they would need to work with creates a closed loop "unlearning" system. The charrette model on the other hand forces them to work collaboratively and to take projects as close to reality as possible within a short time frame. This process of compression, interaction and sharing of creative efforts allows for diverse intelligences to input into a project, elevate it and,through a clear deadline, encourage alignment and joint decision making.

At the IwB, we have conducted nearly two hundred charrettes over the last 18 years both within the curriculum and as special projects with clients including students in this learning format. Of these charrettes, 99.5% created tremendous value to the clients and consistently augmented the student's skills and capabilities. Most students, post-charrette, described learning more in the four days of a charrette then they had in the four years of their design degree highlighting the charrette's transformative properties and the tangible skills and wisdom that they gained from the experience. Highly experienced designers and clients also consistently describe learning new and powerful insights from the charrette process whether as an advisor in the process or as a client. They describe the output as worth more than the hundreds of thousands of dollars typically spent on specialist consultant reports. The reason for this is that the charrette biases integration of knowledge and inclusion of stakeholders in the process to generate outputs that better resolve complex problems. The current design curriculum should totally be rethought using the charrette methodology as a fundamental building block. If charrettes were varied over time with distinct phases and types, the time within which one could train a designer would be accelerated while expanding their wisdom and capability as a professional.

As designers contend with more "wicked" problems, they are called upon to be more innovative and capable of making solutions that result in new markets. To participate in the innovation process, designers need to understand that innovation is multi-faceted and exists in a continuum which I have called the Ecology of Innovation. This framework for understanding innovation and the subject areas

that need to be included in any innovation effort which include:
- Social Innovation which asks how we want to live with each other through a process of virtualization.
- Design Innovation that asks how we might imagine and embody changes through the process of visualization.
- Technical Innovation which address how technology can be used to make designs feasible and available through the process of replication.
- Business Innovation that examines how we can stimulate demand and make products and services more desirable through the processes of propagation.
- And Political Innovation that addresses how we want to be governed and institutionalizes change through the processes of legitimization.

If designers are taught how these aspects of innovation interact they can analyze projects and determine what is possible to change in the world, as well as determine when they are reviewing a proposal the potential missing factors that need to be addressed to achieve success. Potential impediments to innovation such as entrenched political lobbies, or technical inadequacy of the solution, lack of a true market penetration strategy, a design solution that is inadequately differentiated and value generating or a concept that is premature for widespread social acceptance can be identified and worked on. Understanding the relationship of the design innovation to other parts of the innovation process will create fluency in the next generation designers so that they can work with others to achieve an overarching effect.

The Ecology of Innovation provides the blue print for the ancillary knowledge domains that designers need to be extra-knowledgeable about, especially if they are seeking to develop an integrated design solution that is robust, resilient and transformational. A 21st century design education should teach designers about social issues and anthropology, technology and its development to be current with the cutting edge. It should promote an understanding of business objectives, language and requirements for market success and help designers understand the impact of community engagement, mobilization and political advocacy. Without these skills a designer will not be able to help clients, organizations and governments make the change they need. More importantly, this ensemble of skills will enable the designers to increasingly take on the role of a design entrepreneur generating the solutions society is seeking by catalyzing each aspect of the innovation ecology.

To truly accumulate wisdom, designers will need to better understanding the flows of systems within our world. They will need to reflect on the state of things, recognize patterns and how they are changing in the design landscape and most importantly meditate on the fundamental transformations that are occurring.

In the future a significant amount of time will be required of designers to collect data, organize it and timeline it, noting patterns and cycles over time to better-research emerging signals of change for improvement. Designers will need to be taught to develop Temporal Frameworks which situate phenomena in matrices of past, present and future and mull on how relationships evolve between things over time. As problems become more wicked and complex, no one "silver bullet" can provide an answer. Instead it is critical to be able to imagine "unfoldings", to propose a sort of symphony of interventions and actions over time that solve aspects of a problem and with those resolutions enable other aspects to be resolved in sequence and in synergy. To do this well, designers need to be able to meditate on temporal landscapes in the "design space" to draw insight and wisdom from examining the flow of system changes. This process can be taught to students and these practices of meditative discourse and analysis can be encouraged. The result is designs that are of the moment while contemporaneously pointing and even changing with time towards a better future. These designs can be both generative and evolutionary because they have been gestated from a place that absorbed the temporal resonance of thoughtful reflection.

Finally, to ensure that designers are not just creating projects without feedback or understanding of the people and culture for whom the solutions were created, it is critical to shake up the schooling system to bridge the divide between thinking and making. Too often designers have imagined themselves formgivers of new worlds and created their designs from their own suppositions. The current system of education is based almost entirely on this pattern. The design student creates a project that expresses their design intention and identity. They do not interface with end users, the means of production and distribution, the political system or the market place. They present to their teachers who look for aspects of their own influence on the design and grade it accordingly. This goes on for four or more years with little input from anyone whom a designer might really have to deal with. The process is repetitive and banal. There is a lack of true feedback from relevant parties. Students are led to believe that they generate the project which is totally disconnected from the truth that very real and powerful systems govern the space of design and permit what is possible and impossible. Students are not given the tools or experience to elaborate capabilities that might make them more effective and able to generate true positive change.

Because of this, students feel powerless after graduation and take even more time to learn to become effective. An equivalent amount of time in the workplace is needed to be become powerful designers. Restructuring projects in the curriculum to not only focus on thinking (as they do in the universities) or making (as they do in the technical schools) but instead to include in every project the full process of thinking/making/testing/evaluating/refining/shipping allows for an increasing capacity to detect patterns, to see what is effectual and consequential and to identify what does and does not have design impact.

Through these six pedagogical approaches, design education could be transformed from a practice of designing alone, to one of designing something together. Moreover, we can imagine a future where designing how we evolve and improve design

in an evolutionary manner based on wisdom and intelligence can become the new norm. This skill set will prepare us for an era of diversity, inclusiveness and equity an era where we will need to learn to live with multiple intelligences, an era where scalable designs will be available to all helping us build our own personal and collective tomorrow.

Education in the New Age, Alice Bailey, 1954

Understanding Media: The Extensions of Man, Marshal McLuhan, 1964

Where Do We Go From Here: Chaos or Community, Martin Luther King Jr., 1967

Six Memos For the Next Millennium, Italo Calvino, Charles Elliot Norton Lectures Harvard, 1998 translated by Patrick Creagh

The Age of Surveillance Capitalism, Shoshanna Ruboff, 2019

The didactics of design for a society of knowledge: traces of a historical path

Continuing with some of the strategic choices made by the European states at the start of this millennium in relation to the major issues of the environment and of knowledge, this essay aims to reconstruct a well thought-out path on the initial conditions that spurred certain decisions – and the extent to which, twenty years on, the dynamics have characterized the transformations in progress.
This condition of dynamic instability has also spilled into knowledge and professions that are in constant transformation, with increasingly updated knowledge and training models oriented towards forms of lifelong learning. In this new social dimension, training models are revised, in order to better conform them to the needs of an increasingly complex and dynamic society.
The designer's profession is also increasingly oriented towards a systemic project conception that requires possession of broader knowledge, so as to be able to dialogue with specialists in different disciplinary fields and coordinate research with a high content of complexity as a function of its design application.

[research, knowledge, complexity, responsibility, ustainability]

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On the occasion of the "Lisbon Strategy" (March 2000), the Heads of State of the European Union had identified developing a "knowledge-based economy" as the strategic objective to support European countries in the challenges imposed by globalization, and to couple their economic growth needs with the need for greater protection of the environment and of natural resources. Twenty years on, although achieving this ambitious goal still seems far away, it is indispensable that it remain on the horizon of all European countries; a new and different development of the economy, one that incorporates more knowledge and a greater sense of accountability, is an essential requirement for mitigating the negative effects of a globalization that, in addition to increasing environmental decay, has generated strong imbalances and social tensions, as well as the transformation of productive, commercial, and financial processes with negative repercussions on employment, on social protections, and on actual product quality. These negative repercussions have been made even more evident by the current pandemic which, beyond the dramatic consequences for peoples' health and safety, has produced an unprecedented global economic crisis.

At the same time, a *knowledge-based economy* must emerge in order to be able to face – with greater awareness and with more adequate tools – the complexity and changeability of the scientific, cultural, social, and economic phenomena that characterize our time.

As Zygmunt Bauman has said, we live in a "liquid modernity" that obliges us to grapple with a reality that is both increasingly complex and increasingly changeable. In this condition of dynamic instability, knowledge and professions are also in constant transformation, with the consequent need to develop increasingly up-to-date information and training models oriented towards new forms of lifelong learning.

In this new social dimension, in which, to use Umberto Eco's words, "not just individuals, but society itself lives a continuous process of increasing insecurity" (*La bustina di minerva - L'Espresso*), traditional knowledge also becomes uncertain and changeable. This condition requires revising the training models in order to better conform them to the needs of an increasingly complex and dynamic society. Although this need has been evident for some time, design courses and schools have been seeing a certain delay in taking up the challenges posed by this complexity, and in overcoming a conception of designing that, still and too often, interprets the creative act as the product of the individual creator's talent, instead of the result of the synergy among different strains of specialist knowledge. Conversely, the designer's profession must be increasingly oriented towards a *systemic project* conception that requires the designer him or herself to possess broader knowledge, so as to be able to dialogue with specialists in different disciplinary fields and coordinate research with a high content of complexity as a function of its design application.

The search for a specific epistemological statute capable of accommodating the set of knowledge and skills necessary to train the industrial designer has characterized the history of design teaching since the mid-nineteenth century when Henry Cole, appointed superintendent of Britain's design schools in 1852, reorganized their curric-

ulum in order to improve their training and make it more suited to the needs of a productive system characterized by a growing industrialization process. Already on that long-ago occasion, the attempt was made to overcome a training model based mainly on workshop apprenticeship and drawing exercises,in order to experiment with new teaching paths that, with their specific theoretical base, might be able to guarantee adequate technical/scientific training and the development of an indispensable aesthetic sensitivity. During the first decades of the following century, the dynamic confrontation inside the art world led to overcoming the traditional separation between the *liberal arts* and *applied arts* in favour of the conception of "total art" that characterized the production of the artistic avant-gardes. In the didactic sphere, this conception fostered an interpretation of the creative act as an aesthetic experience able to permeate all things, and life itself. It was within this renewed dimension of aesthetic production that the Bauhaus experience (1919-1933) developed. From its very founding, the Bauhaus School sought a synthesis between art and technique, proposing an innovative didactic model that envisaged close collaboration between the figure of the artistic master and that of the artisan master. The development of design research capable of relating the aesthetic/formal dimension with technological innovation was the original mark of Bauhaus's teaching, although from a pedagogical perspective its most important contribution remains the innovation of the preparatory course (Vorkurs). This course was progressively transformed, transitioning from an expressionist orientation with mystical nuances –under the leadership of Johannes Itten–in which the development of free and spontaneous creativity was fostered, to a didactic arrangement more attentive to the artistic languages of the avant-gardes (Constructivism and Neoplasticism) and to innovative research in the areas of *Gestalt Psychology* and *Topology*. Independently of its proximity to different aesthetic currents, Bauhaus's didactic experience demonstrated the potential that a design school has in terms of being a key figure in the cultural debate of its time. Clearly bearing witness to Bauhaus's key role is its significant contribution to the affirmation of Rationalism as a prevalent aesthetic language in design – a contribution that, in addition to having an artistic value, aimed at taking on a social purpose: to guarantee to all, through design, a better quality of the environment in its functional and aesthetic aspects. As Tomás Maldonado recalled(*Ulm* magazine, no. 8/9, 1963), "Bauhaus is to be credited with a constant commitment to opening up to a humanistic perspective of technical civilization […] and to looking to the human environment as a concrete field for design activity," in favour of an open, progressive, and socially useful cultural development. This linkage between creativity and social commitment conceptually linked the Bauhaus experience to the didactic experimentation of the HochschulefürGestaltung (HfG) in Ulm (1952/1968) where, to use once again the words of Maldonado who was its rector and director, the "aim was to point the way to be followed in order to attain the highest level of creativity, but at the same time, and in equal measure, to indicate what the social purpose of this creativity must be" (*Avanguardia e razionalità*, Einaudi, 1974). Although initially understood as a

pedagogical experience in continuity with Bauhaus, the didactics of HfGin Ulm took shape, starting from the first years of its activity, as a particularly innovative training model in which, for the first time, the attempt was made to define an authentic epistemological statute of design teachingby identifying the disciplines of use for a conscious exercise of the profession. This didactic orientation, more accentuated in the years when Maldonado was director, aimed at removing design training from an empirical conception based mainly on experience and competence, in favour of a multidisciplinary and systemic dimension that gave greater value to knowledge – and to the scientific dimension of knowledge. Maldonado, in fact, believed that the didactic model of Bauhaus and of other design schools, based on activism and in which "learning by doing" was predominant, was incapable of incorporating that set of knowledge that was increasingly necessary to those interested in design, in a social and economic system that had become far more complex and open to the accelerated developments of science and technique.

The innovative didactic experience of HfG was looked to by many design schools to offer, in their courses, a larger baggage of knowledge. Clearly influential were the higher courses in industrial design (CorsiSuperiori di DisegnoIndustriale – CSDI): the first state-run design schools instituted in Italy thanks to the fundamental contribution of Giulio Carlo Argan. Activated in experimental form in 1960, the Corsi di DisegnoIndustriale (CSDI) were conceived as full-blown *research communities*, bound to the territory's traditions, with an organization of activities that was wholly original on the Italian training landscape. In each CSDI, the didactic focus was indicated by an authoritative scientific committee also tasked with identifying teachers chosen from among intellectuals, university professors, and above all particularly qualified professionals who, in addition to their undisputed professional qualities, showed an aptitude for teaching. Admission was permitted to a limited number of students: no more than twenty-five per course. In addition to promoting a deeper relationships among the students themselves, this restricted number allowed each of them to be followed throughout their path of training until their introduction into the working world, which almost always took place through the final thesis developed in collaboration with companies working in the area of design. These final theses led to highly innovative products, as in the case of the television sets made by the CSDI in Florenceduring the 1964-65 academic year for the company MagnetiMarelli, under the leadership of PierluigiSpadolini. Although the CSDIs' teaching was directed towards professional preparation, it always considered as prevalent a *humanistic*-type training in which emphasis was placed on such subjects as sociology, semiotics, aesthetics, and above all design history and criticism, with authoritative contributions by Leonardo Benevolo, Vittorio FranchettiPardo, and Giovanni Klaus Koenig in Florence; and by Giulio Carlo Argan, and FilibertoMenna in Rome. Moreover, there is no ignoring their propensity to grapple with issues of social interest, which brought them significant recognition. In this sense, mention should be made of Albe Steiner's commitment to developing "social graphics" for "communication of public utility." This teaching

experience of his, at CSAG (CorsoSuperiore per ArtiGrafiche, or the higher course in the graphic arts) in Urbino, was continued in the courses held at that same institution by his pupil Massimo Dolcini, whose design of the coordinated image for the city of Pesaro – which garnered numerous international honours including, during the 1970s, three shows at Centre Pompidou – bears mentioning. These projects introduced a new orientation into design teaching: shifting design's main interest from the individual product to the service of public utility. This particular attention to the issues of public and social relevance was then inherited by the higher institutions for the artistic industries (IstitutiSuperiori per le IndustrieArtistiche – ISIA) which, in the early 1970s, replaced the higher courses in industrial design (CorsiSuperiori di DisegnoIndustriale)and the higher course in the graphic arts (CorsoSuperiore di ArtiGrafiche), while still maintaining their experimental nature. It bears recalling that during those years, in spite of its importance in the international promotion of the "Made in Italy" brand and thus in the Italian economy, design was unable to enter the University except with individual courses in "Artistic design for industry," inserted into the architecture Faculties and taught by such authoritative figures in Italian design asMarco Zanuso, Alberto Rosselli, PierluigiSpadolini, EdoardoVittoria, Roberto Mango, and Carlo De Carli. It was not until 1993 that the first university degree course in Industrial Design was instituted, and the first design Faculty did not come until 2000. This delay fostered the establishment of numerous private design schools, and long maintained the ISIA institutions as the only state-run schools of industrial design. It bears pointing out, however, that regardless of their placement, in universities or at ISIA institutions, design courses have always been able to update their training offerings by conforming them to the development of knowledge. According to Zanuso, in the teaching environment "the design action is placed in new cultural spaces, far from the trade and from the knowledge handed down by tradition, approaching instead the world of science, of applied research, in places far from production and closer to mental exercise and intellectual activity" ("*Il processoprogettuale*," in *Design italiano: quale scuola?* Franco Angeli, 1990). This statement clearly underscores how, in design, teaching, even more than the profession itself, must be able to experiment with new directions of research and to promote interaction among different strains of specialist knowledge. Only if we can deal with the complexity of knowledge can the school be a leading figure in the cultural debate of its time, and manage to propose paths of research that are actually innovative and of public utility. Although the propensity to anticipate future scenarios was widespread in design schools in the 1970s, one cannot ignore their delay on the environmental issue, which had long remained in the shadows. Maldonado is to be credited with having given emphasis to this topic in his *La speranzaprogettuale: ambiente e società* (Einaudi, 1970), a book that became an important point of reference for all those who, engaged in design teaching, felt the need to affirm an ethical dimension of their designs in order to counter the growing decay of the natural and cultural environment.

The complexity of environmental problems has required design teaching to change paradigm in order to promote the development of a more systemic conception of knowledge. Given this need, the affirmation in the 1980s of a *post-modern aesthetic*, in addition to orienting design towards an exuberant and often excessive iconic loquacity, reintroduced and emphasized at design schools a dialogue on pedagogical methodologies. This dialogue raised once again a juxtaposition between a training orientation aimed at developing an analytical *forma mentis* oriented towards a rational elaboration of concepts (deductive method), and an attitude more open to imagination and creativity (inductive/abductive method) tending to reinforce the symbolic and narrative dimension of objects. This orientation reaffirmed dealing with the aesthetic content of goods as the designer's main task. Although this design direction, in which the aesthetic/rhetorical dimension of objects was reinforced, allowed design schools to experiment with new research paths, it was, in being more attentive to the form than to the substance of things, shown to be wholly inadequate for dealing with the complexity of the most important social and economic issues, starting precisely from the environmental problem. With this awareness, when in the 1989-90 academic year I began my experience as director of the ISIA in Florence, I sought to privilege, in didactics, an orientation towards issues that were of social relevance but at the same time capable of grappling with more advanced technological and scientific research. This is why I asked the designers invited to teach design during those years (De Pas, Segoni, Ferrara, Corretti, Deganello, Mari, Porro, Frateili, Lovergine, Van Onck, Meda, Santachiara, Hosoe, Cisotti, and Raggi) not to replicate their professional experiences at school, but to guide the design courses towards issues of currency, starting with the need to foster, through design, a sustainable, shared development. This requirement also had the purpose of maintaining in the professors an active tendency towards research and experimentation, thereby encouraging a constant updating of the training offerings. It was an updating made possible by the flexibility of the didactic systems that were reviewed every academic year. Thanks precisely to this flexibility, the ISIA in Florence was, before the others, able to introduce into its training the contribution of new technologies and languages of multimedia communication, with the participation of Omar Calabrese, Paolo Rosa (Studio Azzurro), and Antonio Glessi (GMM).

For some years starting in 2006, the ISIA in Florencewas tasked with coordinating an initiative, "Less is next," which compared and established a linkage among the main teaching experiences developed in the area of sustainable design. Already at that time, this initiative had made it possible to deal with many of the issues that, in 2015, were identified by the UN as *strategic points for a sustainable development*which were echoed in the recent "European Green Deal." Much of the research presented at "Less is next" shifted the centre of attention from the design of individual products to the planning of services; and when attention was given to the individual product, it was considered in its entire life cycle, until its *retirement* or, better, its *regeneration*. This orientation, in valuing design as a collective experience, cast clear light on how

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synergy between institutions that, in different specialist settings, develop research and innovation, is increasingly necessary. These synergies require more relationships between *basic research* and *applied research* and between technological experimentations and design applications. On this front as well, some collaborations by the ISIA in Florence with the Faculties of engineering of the Universities of Pisa and Trieste, and with Scuola di StudiAvanzatiSant'Annaand SISSA, are significant. These collaborations have enabled the development of particularly innovative projects and products in the field of information technology, robotics, aerospace, and biomedicine, as well as on the ecology front where **not less but more technological innovation** is a necessity. Excellent results like these would never have been achieved without these collaborations among institutions with different areas of competence.

The 22nd Triennale di Milano 2019, "Broken Nature: Design Takes on Human Survival," curatedby Paola Antonelli, in highlighting the now compromised bonds uniting people to the natural environment, clearly raised the need for a "reconstituentdesign." It is a renewed conception of design that, also in the didactic setting, as Paolo Deganellomade clear in his book *Design politico: ilprogettocritico, ecologico e rigenerativo, per unascuola di design del XXI secolo* (Altreconomia, 2019), is tasked with sustaining a *circular and regenerative economy*. According to EzioManzini (*Design, When Everybody Designs. An Introduction for Social Innovation* - MIT Press, 2015),this task requires a "design for social innovation," capable of supporting the processes of change, and of experimenting with new forms of social aggregation and civic participation, for the development of an "active citizenship" in a "knowledge-based society." This challenge is a demanding but necessary one, and design schools must be able to meet it; and they must be able to maintain on their horizon,at all times, anideal perspective capable of giving meaning and significance to their didactic and design choices.

References

> Paola Antonelli (ed.*), Broken Nature: Design Takes on Human Survival*, CatalogoTriennale/Electa, Milano 2019
> Zygmunt Bauman, *Modernitàliquida*, Laterza, Bari 2011
> Bernhard E. Bürdek, *Design: storia, teoria e pratica del design del prodotto*, Gangemi, Roma 2008
> François Burkhardt (ed.), *ISIA: Qualità e Valore*, Gangemi, Roma 2005
> Paolo Deganello, *Design politico*, Altreconomia, Milano 2019
> Giuseppe Furlanis (ed.), *Lessisnext: per un design solidale e sostenibile*, La Marina, Firenze 2008
> Giuseppe Furlanis (ed.), *La didattica del design in Italia*, Gangemi, Roma 2018
> Ezio Manzini e François Jégou, *Quotidiano sostenibile*, Edizioni Ambiente, Milano 2003
> EzioManzini, *Design, When Everybody Designs*, MIT Press 2015
> Ezio Manzini, *Politiche del quotidiano. Progetti di vita che cambiano il mondo*, Edizioni di Comunità 2018

> Tomás Maldonado, *La speranza progettuale*, Einaudi, Torino 1970
> Tomás Maldonado, *Avanguardia e razionalità*, Einaudi, Torino 1974
> Tomás Maldonado, *Il futuro della modernità*, Feltrinelli, Milano 1987
> Egidio Mucci (ed.), *Design 2000*, Franco Angeli, Milano 1994
> AntyPansera, *La formazione del designer in Italia*, Marsilio, Venezia 2015
> Tonino Paris, *Design: testi e contesti,*Quodlibet, Macerata 2017
> Raimonda Riccini (ed.), Tomás*Maldonado-Bauhaus*, Feltrinelli, Milano 2019
> Nicola Sinopoli (ed.), *Design italiano: quale scuola*, Franco Angeli, Milano 1990
> Claudio Vagnoni, *Help design*, Gangemi Editore, Roma 2012

The Role of the School
Reflections on student's learning experience

Which should the role of a design school be, in facing the emerging ethical, social, economic and environmental concerns related to human activities? How do design communities interact with society at large, and the planet? What is the ultimate goal of the learning experience? What kind of training should be expected for a (future) designer?

This article develops ideas that can help to address these questions. First, with a short review on the relations between academic communities and its environments in a series of relevant design schools of last century. The review sets the field on which XXI century design training is grounded, and opens the reflection on how to develop their values, concerns and practices.

Later, through the experience at ELISAVA, Barcelona School of Design and Engineering, a series of cases are deployed, with the concurrence of BA Undergraduate programs with Research Masters, traditional design disciplines with emerging programs as the Master in Creative Process, showcasing the wide and transdisciplinary nature of learning experience.

Triggered by the school's particular background and environment, and stressing the importance of interactions, context and materiality, a series of threads are suggested to nurture the discussion on design education.

[Creative process, Academic community, Context, Student's journey]

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There is a broad set of open reflections on human societies and their relation with the planet, that range from ethical and social concerns, related to gender, diversity, privacy and ownership of data and technology, to economic growth models and their impact on the environmental crisis. The role of a design school in tackling these challenges is not evident. To devise "courses of action aimed at changing existing situations into preferred ones" (Simon, 1996) can be addressed directly through core values in the creative community, such as autonomy, freedom, impact, responsibility and interaction, which have finally great and sometimes unexpected economic, social and environmental implications.

What should the role of a design school be in facing this context? How do design communities interact with society at large and the planet? What is the ultimate goal of the learning experience? What kind of training should be expected for a (future) designer?

The student's experience

"…and then he invited me to visit him next afternoon, for us to elaborate together a study plan."

This sentence from the book *Confusion of Feelings*, written by Stefan Zweig and published in 1927, (Zweig, 2014) reveals the intimate, personal and constructive nature of learning. The sentence, expressed by the professor after an initial conversation with a prospective student, becomes a statement on the purpose of matching the university curriculum with the student's particular study plan. It also implies that the study plan will be completely conditioned by the student's background and aims, in a context where the professor's role is understood as the main medium for bridging the gap between the student's current reality and the preferred future. To achieve this goal, both the student and the professor start a journey that confirms the real nature of the learning experience; that is, a complex, unique, meaningful and even embodied experience. Reading the sentence almost a century after it was first published evokes a feeling of distance, loss even, when reflecting on the current context of design education.

In recent decades, design schools have aligned their diverse backgrounds, related to arts, crafts, polytechnic or media environments, so that they could be structured and positioned in the same way as any other higher education institution, most of them seeking affiliation with already existing or recently founded universities. This new environment has brought about unexpected consequences, partly related to what is sometimes a highly rigid regulatory framework -that impacts both the education processes and quality assurance-, an overwhelming increase in student populations, and a research-based policy focused on indexed publications and international rankings.

A clear collateral effect of this upgrade is that our understanding of learning as a meaningful and unique experience, seems to have been forgotten. The rigorous and complex upgrade taken on by design schools in recent decades seems to have taken its toll on the efforts invested in fully understanding students' learning journey. The research-driven, quality-pressured and indicator-based structure often arising from this context is commonly perceived as a "loss of freedom" and damaging to the creative process and learning experience.

When asked to design the landscape for the Renaturation of the River Aire, which had been canalized in the XIX century, Atelier Descombes Rampini "proposed to combine the canal with a vast divagation space for the river." The designers state: "For the drawing of the river itself (…) we proposed a launching pattern whose form addresses the play between the river flow and the prepared terrain. This diamond-shape pattern opens a complex series of undetermined channels for the flows. [Nevertheless] We must accept this paradox: the more defined the grid given to the river, the more the river will be free to design." (Renaturation, 2017)

The concept of "divagation" pushes the boundaries of structured and efficient management, and challenges the role of a design school in relation to the students' learning experience. Furthermore, the paradox expressed by the landscape architects can be interpreted as a metaphor for the structured plot, within which any design school has to work.
Meeting expectations regarding the competencies to be acquired, course content and learning outcomes, not forgetting core concepts in the design environment, such as exploration, critical thinking, openness and uncertainty, requires understanding design training as a fluid, open, flexible and multilayered experience. Academic planning and management, therefore, should help create the fertile soil which enables each and every student to follow the course of their curiosity, offering them a hub of meaningful connections and a springboard to a potential future.

The myth of the creative community
A short review on design education in the last century could surely help understanding its background and nature in relation with the social context, as long as suggesting opportunities for future developments. Undoubtedly, many design schools draw on the Bauhaus as a conceptual model. The Bauhaus' origins can be linked to the legacy of British artists and craftsmen's guilds from the XIX century. In its early years, the school promoted the idea of a community of people in an autonomous and self-sufficient environment. This idea implied understanding design as the delivery of the knowledge and practices of this closed community to society and the environment. The image defined by Walter Gropius, "from a spoon to a city", highlights this mindset, in which design is understood as the process for producing forms that both condense and trigger human needs and aims. Later on, a new approach promoted

an increasingly strong link between the school, the industrial sector and society as a whole. The forces and energies that both stemmed from understanding the training process from within and arose from the external context, involved a complex and wide range of determinants, from functional to artistic layers, and political to ethical ones. The diverse range of problems the school underwent during its fourteen years of life, in the extremely controversial environment of interwar Germany, are, therefore, well documented. The legacy of the Bauhaus can also be understood as the acknowledgement of the efforts of its directors, academic staff and students to alternatively preserve and break this boundary between school and society. (Wick, 2000; Hochmann, 2002)

This legacy could be considered as conceptually split in two. On the one hand is the isolated creative community of Black Mountain College, founded in 1933 in rural Appalachia, and linked to anti-authoritarian education principles and set in the countryside of a hyper-consumerist American society. Black Mountain College community, led by key figures like the Albers, Cage or Buckminster Fuller, developed a strong sense of experimentation as the driving force for creative people's actions. Based on an open mind and deep autonomy, this approach was commonly criticized for being divorced from social transformation. (Katz, 2002; Diaz, 2015) On the other hand, the Ulm Hochschule für Gestaltung, founded in 1955, hosted the controversy between former Bauhaus student and first Ulm director Max Bill, and Tomás Maldonado. Once again, the context in which the school project was developed reveals a high commitment to the social and political issues of post-war Europe. The strong positioning of the school, which led to its radical closure, is proof of the design community's readiness to serve as an active agent for the transformation of society, especially against the consumer capitalism mindset usually related to industrial and graphic design. (Krampen, 2003) The duality between these two models was cause for deep reflection in the design context of the 1950s and 1960s, raising questions regarding the content included in the curriculum – art, systems thinking, sociology, mathematics, programming…- and the methods developed inside and outside the school -workshops, team working, creative freedom, links with the environment, and so forth.

The deschooling proposals developed in the 1970s brought people to reflect upon the social and individual goals of education, promoting pedagogies that could break the boundaries of conventional schooling -understood as structured learning in a precise environment, with a chronologically managed interaction with learning and the world. (stated by Illich, 1973 and Reimer, 1971) The "Universitas Project" launched by Ambasz and the "Whole Earth Catalogue" by Brand could be understood as an iteration of the deschooling proposals. Both projects embraced the complexity of the contemporary world, understanding the transformation that digital technologies and media could bring about in terms of knowledge and learning. Ambasz's proposal promoted the concept of the school as a hub of connections, a radical understanding

of the nature of learning in a manmade milieu. The different threads of thought he initiated were taken up by Umberto Eco, Jean Baudrillard or Hannah Arendt, among many others. In his response to Ambasz's call for ideas, Eco states that "faculties will not exist because the teachers will be with the students and with the local communities in the various environments [which in turn will lead to their] discovery of certain initial semantic conventions and the intervention becoming a process of re-semantization." (Ambasz, 2006) Brand's ambitious project, developed in the context of a free-thinking California of the late sixties, also connects with this blurring of faculties, pushing the formal boundaries of knowledge and practice, and suggesting the fundamental threads of learning in the digital era, such as open source, hyperlinks and the flattening of traditional cultural hierarchies.

Nevertheless, since the 1980s, the rise of digital technologies and the exaltation of creativity based on business-driven innovation, has been of little use in adding layers of complexity to the reflection on what design schools should be. The open mindset of the first digital environments was immediately swallowed up by hyper-capitalist processes, with minimal or nonexistent ethical, environmental or social concerns. In parallel to this, the aforementioned research-led policies were quite possibly creating a gap between design schools' strategic plans and the ordinary experience of student communities. However, in recent decades we have borne witness to a flourishing conversation on the role of Universities and their relationship with the productive and social environment, in addition to their traditional dual mission of teaching and research. This new third mission, based on knowledge transfer and real impact on society, has triggered a meaningful reflection on the ultimate goal of higher education. Design schools, assuming an active role in this impact, have increasingly opened a discussion on their essential nature, their practices and their interaction with other collectives (This is an Art School, 2017, and Sachetti, 2018) that set promising threads on what design training should be in XXI century.

Some reflections from Barcelona
Prospective students access design study programs in a hyperlinked and over-resourced context. This situation invites a deep reflection on the traditional role of the school, conceived as an environment offering access to exclusive equipment, knowledge and experts. Therefore, it may not be possible to uphold the concept of the school as an isolated, physical sanctuary of knowledge, while the offering and opportunities beyond its confinements may be greater and more attractive than those within them. Furthermore, the school may no longer be understood as a controlled environment in which students can learn a set of contents and be trained in a series of practices, with the promise that they can be applied in a not so near future –three or four years being too long, with today's dizzying pace of change. The role of the school should not be that of managing the student's knowledge and expectations, but rather to be sensitive and give course to their aims and curiosity. The first year of the BA in

Design at Elisava merits a single, global headline: Discover. Students are encouraged to discover what their aims and capacities are, along with the different design fields and opportunities. The year is not so much focused on techniques and foundations, but rather on fostering the sense of inner reflection and constant exploration that one expects to find in a designer. This mix of opportunity and potentiality serves as a driving force throughout the four-year program, giving rise to a constant and fluid process of expansion and reflection that helps designers to form an identity and understand the nature of their relationship with the environment.

This leads us directly to the concept of transdisciplinarity. Undoubtedly, the issues designers face today have a high level of complexity that cannot easily be tackled from a single domain. Therefore, contrasting one's individual capacities and concerns with those of other students, professors, school staff and citizens in general helps students to develop a sense of balance and achieve impressive personal and competence-based outcomes. As a school keen to foster fruitful interactions, Elisava allows first-year students to participate in challenging projects with final year students and PhD candidates. Final degree projects promote a series of design challenges linked to the school's strategic identity and research threads, and involving external stakeholders to which student's from any design discipline can join. This is a bold approach that not only nurtures the student's experience, but also the school's research focus and practice. As many researchers have stated, (Friedman, 2003, Findeli and Coste, 2007, Vaughn, 2017) bringing practice to the research field should raise question marks over the primacy of information and knowledge over performance and ability. It can also offer considerable benefits not only in terms of ethical and social commitment, but also regarding the political and economic role of design schools as active agents in society. In a world where everybody designs, (Manzini, 2015) the stronger the set of individual competences are, the better a designer will perform with any of the other players on the field. An open understanding of this approach has pushed Elisava's positioning as a distributed school.

The idea of a distributed school is very closely linked to the extended campus Elisava has been developing in recent years. Based on La Rambla, the busiest thoroughfare in the centre of Barcelona, the school's daily life is exposed to the pressures of an environment heavily affected by tourism and real estate companies, and plagued with major economic and social concerns. Breaking both the physical and conceptual boundaries of learning, the school has generated, at one and the same time, a need and an opportunity. The need to connect students with resources and equipment that cannot easily be made available in the central building also ties in with the opportunity to match students' aims to have "real world" experiences. The school is no longer confined to a specific building or campus, and has shifted to become a set of values, processes and concerns that could be developed across a diverse range of contexts, temporalities and expected outcomes. Based on the situated knowledge

(Haraway, 1991), the assumption that the nature of a design is strongly related to the body and values of the designer, and conditioned by the specific environment in which it is deployed, has been referred to by Ron Wakkary with the term "to design with". (Wakkary, 2020) Working with local communities –residents, tourists, migrants and craftsmen- under the platform Design for City Making; launching a set of events in key institutions that promote the city of interactions; developing a study practice in Milan's Fuorisalone or with local designers in Casamance, Senegal; working on final degree projects in companies or startup venues; are some of the examples of the strength of the school's proposal "to design with" a wide range of people and resources in specific contexts.

Furthermore, this distributed school breaks a certain abstract approach to design, developed over the last two decades. Design environment has broadened its scope, opening its expected outcomes to include services, systems and strategies. This expansion has clearly been beneficial to the conversation around design, bringing into the spotlight the socio-economic and even political dimension of any design practice. Nevertheless, this shift has also been shadowed by a strong link to business based strategies. And it has embraced an abstract, mostly *non*-situated, understanding of design that collides with one of its essential dimensions: materiality. The specific knowledge that a designer has to put into practice when dealing with material, color, texture, image or light should act as an under-layer of the reflective and precise connection of the outcomes to the context. Digital technology has pushed this gap between the concrete design practice and the abstract outcomes. (Flusser, 2017) Following on from Haraway, Maria Puig de la Bellacasa highlights the tactile dimension of the concept of care. Tactility generates reciprocity and a common understanding in human interactions. Far from the hierarchical and abstract primacy of vision, any care-based process requires an empathic understanding of the other –whether that be human or non-human– along with real time feedback that constantly informs and drives the process. (Puig de la Bellacasa, 2018) The focus on the tactile dimension of such a relevant issue as care strengthens the dual nature of design practice: reflection and practice. Linked to Schön's fundamental proposal (Schön, 1983) and assuming the leading role of craftsmanship (Sennett, 2008), the material nature of design is having clear impact on education. (Somerson and Hermano, 2013) Materiality -whether it be communication, digital interaction, product or space design- should not be treated as the expected outcome of any design strategy, but rather as the guiding focus for ensuring its quality and connection to social, ethical and environmental concerns. And this attention to the material dimension of design also generates intense debate on the extractive and productive nature of business-based *innovation*. Opposed to it, Martin Tironi and others (Strebel, Bovet & Sormani, 2019) suggest the concept of *maintenance*, not only as an environmental concern, but also as a political and social positioning based on a semantic activism –as suggested by Eco- that sets in motion an open reflection on the productive model, on human identity and its relations with the planet.

Viewing the student's learning experience as the backbone to academic planning, promoting diversity and relevance in interactions with a broad range of people, resources and contexts, and ensuring the concrete nature of design processes and outcomes, will surely lead to a critical awareness, ethically responsible and environmental careful discipline of design.

References

> Ambasz, E. (2006). *The Universitas Project: solutions for a post-technological society*. New York: The Museum of Modern Art.
> Díaz, E. (2015). *The Experimenters. Chance and Design at Black Mountain College*. Chicago: The University of Chicago Press.
> Findeli, A. and Coste, A. (2007). De la recherche-création à la recherche-projet : un cadre théorique et méthodologique pour la recherche architecturale. *Lieux communs, 10,* 139-161.
> Flusser, V. (2017). *El universo de las imágenes técnica*. Buenos Aires: Caja Negra.
> Friedman, K. (2003). Theory construction in design research. *Design Studies, 24*(6), 507-522.
> Haraway, D. (1991). Situated Knowledge. In *Simians, Cyborgs, and Women. The Reinvention of Nature*. London: Free Association Books.
> Hochman, E. (2002). *Bauhaus: crisol de la modernidad*. Barcelona: Paidós.
> Illich, I. (1971). *Deschooling Society*. London: Penguin.
> Katz, V. (Ed.) (2002). *Black Mountain College: una aventura americana*. Madrid: Museo Nacional Centro de Arte Reina Sofía.
> Krampen, M. (2003). *The Ulm School of Design: beginnings of a project of unyielding modernity*. Berlin: Ernst & Sohn.
> Maniaque-Benton, C (Ed.). (2016). *Whole Earth Field Guide*. Cambridge: MIT Press.
> Manzini, E. (2015). *Design, When Everybody Designs*. Cambridge: MIT Press.
> Puig de la Bellacasa, M. (2018) *Matters of care: speculative ethics in more than human worlds*. Minneapolis: University of Minnesota Press.

> Reimer, E. (1971). *School is Dead: Alternatives in Education*. London: Penguin
> *Renaturation of the River Air*. (2017). Retrieved July 9, 2020, from https://urbannext.net/renaturation-river-air/
> Sacchetti, V. (Ed.). (2018). *Design as learning: a school of schools reader*. Istanbul; Amsterdam: Istanbul Foundation for Culture and Arts; Valiz.
> Sennet, R. (2008). *The Craftsman*. New Haven: Yale University Press.
> Schön, D. A. (1983). *The Reflective Practitioner*. [N.S.]: Basic Books.
> Simon, H. (1996). *The Sciences of the Artificial*. Cambridge, MA: MIT Press.
> Somerson, R. & Hermano, M. L. (Eds.). (2013). *The Art of critical making: Rhode Island School of Design on creative practice*. Hoboken: John Wiley & Sons.
> Strebel, I., Bovet, A. & Sormani, P. (Eds.). (2019). *Repair Work Ethnographies: Revisiting Breakdown, Relocating Materiality*. Singapore: Palgrave Macmillan.
> *This is an Art School*. (2017). Retrieved June, 14, 2020, from https://www.tate.org.uk/whats-on/tate-modern/tate-exchange/workshop/art-school
> Vaughn, L. (Ed.). (2017). *Practice Based Design Research*. London: Bloomsbury.
> Wakkary, R. (2020). Things we could design in more than human-centred worlds. Summary retrieved from ELISAVA Tech Day 20: Biotech & Future Sustainable Societies. Online: https://www.elisava.net/en/calendar/tech-day-20-biotech-future-sustainable-societies
> Wick, R. K. (2000). *Teaching at the Bauhaus*. Ostfildern-Ruit: Hatje Cantz.
> Zweig, S. (2014). *Confusión de sentimientos*. Barcelona: Quaderns Crema.

Teaching Through Making in Architectural Design Education

The subject of this paper stems from the necessity of implementing teaching of concrete experiences in architecture design courses. In the past years, several universities have participated in the redefinition of the pedagogy concerning the education of technical course because they noticed that students are not usually able to *correctly define* the best materials and the structural logic for their projects, and keep it consistent with their architectural design choices. In, particular this paper recalls and analyses several hands-on activities performed at the University of Tokyo and at Université Libre de Bruxelles. Besides design studios, the study of architecture, materials and structure is often reinforced thanks to targeted activities such as summer schools and hands-on workshops. Full-scale constructions constitute an essential element of research by design of these targeted activities. Research by design as a mode of inquiry has its own particular modalities and one of the most effective strategies is to design and build a small pavilion. Building a pavilion presents several positive aspects because it can be done at reasonable costs, it is ideal to test new materials and it can be built by the students themselves. Learning outcomes are often very positive because, thanks to these activities, students get a first concrete experience of making in architectural design. This paper shows several experiences within academia where architectural design developed through making have been applied to temporary projects. A tea house, a pavilion for archeologists, a pop up school at Farm Cultural Park in Favara and a pavilion for the exhibition *999 Questions on Contemporary Living* held at Milan Triennale are discussed. Integrating making into architectural design education is a way to make students more aware and to develop in them a pleasure for the physicality of making.

[Pedagogy, Design and Build, Small Pavilion, Parametric design, Fabrication strategies]

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Background Issue
Today, architectural design education puts theoretical knowledge above practical ability. There are several areas into of concern, with a widespread feeling that many architectural students and graduates are trained on the humanistic side, but they are simply not being provided with the skills they need to work in practice (Gaber, 2014). The key deficit is in technical ability, students are not usually able to *correctly define* the best materials or the structural logic for their projects, and keep it consistent with their architectural design choices. One of the actions undertaken is to reinforce the courses in architectural design by introducing some hands-on experiences aimed at offering opportunities of learning by doing to students (Kolarevic, 2003). This training aims at enabling them to create construction detail and co-ordinate complex technical input into a concept, and to create construction documentation (Walker & Self 2011).

In schools of architecture, there is a rising demand for students wanting to participate in hands-on experience where they are involved in the translation of concepts into reality. This demand has led to an increasing engagement with live projects (projects with a real client and output that is useful to those outside of the academy) as a way of introducing some of the elements that are difficult to address in University (Symeonidou, 2017). In particular, live projects are great at introducing an element of costing, about close teamwork (often with other disciplines), and making quick decisions, amongst other things. At the University of Tokyo, at the Université Libre de Bruxelles, many lives projects have been run both at undergraduate and in the postgraduate course between 2010 and 2020 and see this as hugely valuable and enjoyable for the students of these Universities. They learn to communicate with clients (both listening and presenting) as well as developing their work to a buildable (and sometimes actually built) solution.

Some key reflections about including making in teaching architectural design students arose:
*What teaching methodology should be employed when teaching making in architecture?
How can we enable students to develop a pleasure for technical knowledge
of materials and structures in architectural design?*

In searching for responses to these reflections, this paper explores the development of some workshops aimed at building some pavilions as a strategy to get students to get a firsthand knowledge of the reality and difficulties of building. These workshops developed in response to a growing awareness that usually in architecture faculties focus is primarily on teaching theoretical projects and about how to make space rather than how to build and in making.

*Building a pavilion as a tool to shorten
the distance between theory and construction*
This paper elaborates on how small pavilions were introduced as a tool to develop these knowledge aiming at promoting an interest among students for making (Symeonidou, 2014). The main idea behind the construction of a small pavilion is to shorten

the existing distance between conception and construction. Design and build a small pavilion has several advantages: it does not require significant economic investment (often a private sponsor or a research fund covers the costs) but it is an invaluable tool to advance applied research in the use of new software (e.g. to optimize structures), in testing new solutions, materials, forms, performances and assembly techniques. In addition, students increase their desire to participate in hands-on experiences that translate theoretical concepts into physical realities (Liotta & Belfiore, 2012). The works described in this paper are rooted in the academic field and involve both teachers and students: through theoretical-practical design workshops students approached for the first time experiences of applied research and self-construction. During these activities, students are encouraged to design and build temporary architectures to test all aspects of translating ideas into concrete projects.

Research by design as a mode of inquiry had its own particular modalities and one of the most effective strategies is to design and build a small pavilion (Geissbühler, 2014). Building a pavilion can be done at reasonable costs, it is ideal to test new materials and it can be built by the students themselves. At the end of the workshops, students understand how a pavilion can be made. They realize that architecture is not only a rendering of ideas, but that there is the materiality of things and a way to assemble them to make a building stand up thanks to its structure. This passage is very important, because the constructive process reveals an entire new dimension which is not only that that relates to an architecture program and its functions (Doyle & Senske, 2016). Instead, it focuses on how things are built, on making as a process that can be integrated in the design process. Pedagogically, built architecture and design can stimulate students in maturing a true concrete experience that is not only virtual and theoretical, as often happens in their training courses (Paranandi, 2013).

Case Studies
In this paper four pavilions are described, which were the output of four different workshops. They were respectively held at the University of Tokyo in 2011, at the Unesco Heritage site of Agrigento in 2014, at Farm Cultural Park in Sicily in 2015, and in Milano in 2019. The workshops were organized with the following structure: two universities invited, a topic linked to culture, a predefined budget, a limited number of students, a two-phase period including design and construction, a material such as wood, plastic or metal chosen as main material for making the project and use of parametric software and digital fabrication. The first pavilion is part of a reflection on tea culture, the second pavilion is a speculation on a temporary shelter for archeologists, the third is a pop up school for children and the fourth is a pavilion for the exhibition *999 Questions on Contemporary Living* held at Triennale of Milan.

Approach and Practicability of Parametric Design and Digital Fabrication
The workshops provided a point of reflection within the academic setting to consider the consequences of computational design when applied to the physical reality of making, rather than stressing too heavily on the form-finding aspects of computational design. Each of the pavilion's physical presence and their feasibility on multiple levels were evaluated and reconsidered throughout (Fleischmann et al. 2011).The process also assessed the technology employed and the highly sophisticated elements that can be produced, whilst relieving participants, who were inexperienced in construction, of some issues including protection from weather, foundations, and structural stability over an extended period of time,thanks to the temporariness of pavilions. It also encouraged material experimentation, intuitive predictions for structural elements, and a trial and error approach in detailing and assembly.

Digital Tea House Workshop, Tokyo
Held at the University of Tokyo, together with Columbia University GSAPP, Digital Tea House was a joint workshop with the aim to design and build three pavilions for hosting tea ceremonies. Issues addressed in the three-week workshop ranged from applications of computational design, interpretations of tradition and culture, structural stability, to practical solutions for quick physical materialization within limited time and budget. The workshop was divided into two sections. The first part introduced computational logic and concepts, which led to the second part where explorations relating to the Japanese tea ceremony culture served as a pretext for further exploring digital design and fabrication. Three teams, each of 6 to 8 members, ultimately produced three full-scale tea houses to test out their concepts, methodologies and materials. Several elements served to make comparisons and analysis during the process and later in two distinct outcomes: baseline for common software (Rhinoceros and Grasshopper), principal material (50 sheets of 9mm and 12 mm thick 3x6 plywood), fabrication method (CNCrouting), and budget (of approximately 1,500 €, per team, excluding plywood and CNC fabrication costs). The output of the workshop clarified that, firstly, parametric processes are not contradictory to traditional cultural principles; and second, how traditional elements of the teahouse can be decoded and formally reinterpreted through parametric design (Ko & Liotta, 2011).

The design of the pavilion "Nami-no-Ma (Space of Waves)" was guided by strong aesthetic characteristics of the tea ceremony. The expression of the beauty and imperfection of nature inspired by the tea bowl is translated to plywood, which surrounds the basic 2-tatami traditional layout of the interior space. The initial concept was drawn from the slightly irregular traces left from the process of throwing the tea bowl on the potter's wheel. The bowl used in Japanese Tea ceremony favored controlled imperfection in the aesthetic of yuragi and yugami. Yuragi is the slightest warping often from the uneven pressure of the kiln, which later developed into a more deliberate and artistically restrained distortion of yugami. Pavilion Nami-no-Ma boldly translates the phenomenon of yugami in the same calculated manner as the ceramicists of the past, with every layer of plywood by taking advantage of the CNC router. Efforts to create a natural and flowing form from the 3-axis CNC routing, which is a flat surface fabrication, pushed for experimentations with half-depth grooves in specifically calculated patterns on the

9mm plywood. The key challenge was in achieving the desired bend in a continuous curve following a circular geometry of the plan.

Enabled by close communications with CNC router operators, tests initially began with grooves of different depths and stitch patterns of varying lengths. The triangulated grooves eventually proved to be the ideal solution for 3-directional curves to be fixed on site, whereas perpendicular grooves only enabled 2-directional bending per panel. Tea houses typically have a limited level of openness to the outside. In this interpretation, the varying thickness of the wall becomes the boundary between the tea ceremony taking place inside and the surrounding nature, while the views are controlled by the density and bending angle of each layer. The undulating waves also facilitate the functions of tokonoma and nijiri-guchi, where the largest opening in the pavilion is structurally reinforced beneath the lower curvature to support body weight.

Architecture X Archeology, Agrigento

This is a workshop that was held in 2013 in the premises of the Archaeological Park of the Valley of the Temples in Agrigento, Sicily. The Kengo Kuma Lab of the University of Tokyo, the Polytechnic of Milan (respectively led by the author and Marco Imperadori) and the University of Palermo had explored design possibilities and the construction of lightweight structures to temporarily protect archaeologists and their excavations otherwise exposed to atmospheric events. The workshop was divided into two parts: a preliminary part, lasting 45 days, took place at each respective University; a second phase, seven days long, took place on site. Architecture X Archeology was a reflection on the use of lightweight shelters and with their technical aspects – anchoring to uneven ground, runoff and collection of rainwater, transportability – and the cultural issues involved in the inevitable transformation of the original site. The workshop served as a point of reflection on the ongoing research into archaeological shelters and the reinterpretation of traditional systems through parametric design.

The design of the Molecular Shelter temporary roof reinterprets a concept borrowed from traditional Japanese culture. In fact, the roof is inspired by the structural system known as *Tokyou,* typical of traditional Japanese wooden temples where large roofs perform both practical and aesthetic functions (Masera et al., 2015). The project consists in a light and modular system, easy to assemble in a reasonably short time. The structure is designed to allow archaeologists to move the shelter without any professional help. The entire structure is made of pine wood and is composed of a joint system of four struts, with a constant section, tied along the beams in the X and Y directions with 6 mm screws; the screws add resistance to rotational movements due to horizontal external forces. As far as manufacturing is concerned, a simple system was preferred instead of sophisticated machinery that is difficult to find on site. The structure is covered with micro-perforated *elyplast* panels. Moreover, due to the limited vehicular access to archaeological sites, it has proved strategic to use both light materials and easily transportable manufacturing tools. The planned budget of 1,600 € was respected during the implementation phase. The prototype is still in use in the Park of the Valley of the Temples.

Pop Up School Workshop, Favara

The theme of the workshop stems from the request of Farm Cultural Park to have pop-up spaces for summer educational activities. Students from "University of Tokyo and of Polytechnic of Milan" participated in a one week workshop. The workshop stimulated the creative and unconventional use of waste plastic materials used as elements for building. Specifically, after selecting plastic containers used for local cheeses as the design element, the author proposed to use his own theory defined as «articulation by multiplication of particles», which means to use a single element to structure a larger whole (Liotta, 2018). This conceptual tool allowed to design temporary ultra-light architectures partly empirically investigated (through physical models and iterative attempts on site) and partly drawn with parametric software. Finally, the structures were assembled using plastic cable ties. This exercise was useful as a reflection to understand the possibilities that plastic has to be reused or up-cycled, giving it a second life. The Pop-up structures, each of which was given a name, respond to various programmatic needs: the Felix Helix is an open-air class; the Scala dei Milanesi is an auditorium; the Hi-Conic is a personal reading corner; The Brains is a reading and relaxation space. Made with an up-cycling spirit, through the re-use of ethereal plastic buckets typically used to hold ricotta cheese, these temporary structures offer the possibility of creating instant spaces for learning and meeting. The event combines the themes of education and food: reuse of waste to create educational spaces.

999 Temporary Pavilion, Milan

The *999 Questions on Contemporary Living* exhibition, curated by Stefano Mirti, has been evaluated by the press as one of the most innovative events of recent decades at the Triennale of Milano. A co-joint team of students of the Université Libre de Bruxelles and of the Polytechnic of Milan (respectively led by the author and Marco Imperadori) was invited to participate in the design of an installation questioning the way of living today in a minimal co-dividual space in Japan (Liotta, 2018). The small installation/pavilion consists of a tribune with three 45 cm high steps and a silhouette of a small house with an archetypal shape. The concept developed is atypical because instead of showing something (as expected when invited to participate in an exhibition), the design team decided to propose a pavilion designed to host: people who pass by can appropriate it and sit, read, chat or lie down. The pavilion is complemented with some lecterns on which are located books which are there for offering the visitors the opportunity to sit in the space on display to read a story to someone; video projections complete the installation showing the theme of post-individual architecture for sharing through interviews with leading figures in Japanese architecture such as Kengo Kuma, Shigeru Ban, Satoko Shinohara, Sou Fujimoto or Taichi Kuma. The structure is made of white painted steel completed by perforated metal panels in homage to the mashrabia typical of Arab culture in Sicily. The design took ten days, while the pre-cut elements in the factory were assembled in situ by four students and two workers in one day for a total

cost of about 4,000 €. After three months in the Triennale Museum, the installation was transferred to the Polytechnic of Milan (Polo Territoriale di Lecco) and is now used by students as a relaxation space. This prototype of a shared minimum space/home investigates new ways of using public exhibition space in a intimate way. The pavilion was meant as a platform that welcomes the user to sit down or lie down whilst also it plays on capturing the attention of passing by visitors.

Conclusions

Some conclusions can be drawn: the majority of students show 1) a true interest for a pedagogical offer concerning concrete experiences (such as workshop or summer school that propose construction of small architectures, pavilions, parametric teachings etc.) 2) Students learn that architectural design is a process that needs to be discussed from the start, from the design stage, together with other specialists such as engineers and craftsmen for mixing technical and theoretical knowledge.

The crucial shift away from more traditional courses is that instead of teaching notions, instructions and procedures and following students in the developments of their ideas into a project that remains on paper, the focus here is on stimulating pleasure and excitement for architectural design through making (Salama, 2008). The workshop format is different from what is usually taught in architecture faculties. This format has proved to be a very positive experience for students who have noticed a refreshing approach to architectural design. The hands-on activities of the workshops prove to be inspiring and helpful for students. Not only did they feel that integrating architectural design, materials and structures can be fun, but also that their confidence in design increased. The workshops underline the importance of learning the complexities of translating ideas into real artifacts. By doing so, workshops promoted an interest among students for developing a pleasure for materials, structures and logic assembly within architecture.

The workshops made students understand these aspects of architectural design are not something that comes at the end of the project, but instead they should be considered throughout the whole architectural design process. In a sense, the job of the architect is to choose between different options. Each designer has his own parameters allowing him/her to make choices, be they cultural, aesthetic, economic, functional, historical, contextual or other. Only those who are sufficiently sure of the options taken or their settings will be able to choose with confidence (Ko & Liotta, 2011).

In his writings, Cyril Stanley Smith (1975) claimed that aesthetic selection was central to both genetic and cultural evolution. Without the aesthetic curiosity human beings might not have survived or may have remained in the Stone Age. For the professor emeritus in Materials Science at MIT, who was a metallurgist as well, most of man's inventions made their appearance in decorative applications: the wheel, for example, appears first in decorative jewelry and children's toys. Smith has proved that innovation and discoveries are not born under the pressure of need, but thanks to an aesthetic curiosity that can also prime over function, especially when it comes to architectural

References

> Doyle, S. & Senske, N., (2016). Between design and digital: bridging the gaps in architectural education, *Research Based Education,* 1, 193
> Fleischmann, M., Lienhard, J. & Menges, A., (2011), Computational Design Synthesis: Embedding Material Behaviour in Generative Computational Processes, in *29th eCAADe Conference Proceedings*, University of Ljubljana, 759-767.
> Gaber, T., (2014). The Agency of Making and Architecture Education: Design-Build Curriculum in a New School of Architecture. *International Journal of Architectural Research,* 8 (3), 21-31.
> Geissbühler, D. (2014). Research by Design, in *Book of Abstracts of Fourth International Conference on Architectural Research by Design (ArbD'14)*, Lisbon, Portugal
> Ko, K. & Liotta, SJ. (2011). Decoding Culture Parametrically: Tea House Case Studies, *International Journal of Architectural Computing (IJAC)*, 4(9), 325-338.
> Kolarevic, B. (2003), Architecture in the Digital Age: Design and Manufacturing, Taylor & Francis, Washington DC.
> Liotta, SJ. & Belfiore, M., (2012). Patterns and Layering: Japanese Spatial Culture, Nature and Architecture, Gestalten, Berlin.
> Liotta, SJ., (2018). Temporary Architecture for Sharing, *Agathon, International Journal of Architecture, Art and Design,* 4, 29-36

> Masera, G., Imperadori, M., Vanossi, A., Liotta, S. J. and Ito, Y. (2015). Modular, Adaptable Shelters for Environmentally Sensitive Archaeological Sites, in Falk, A., Imagawa, N. (eds), International Colloquium on Bio-based and Bio-inspired Environmentally Compatible Structures, IASS, Tokyo.
> Paranandi, M., (2013). Making Ripples Rethinking Pedagogy in the Digital Age, in *International Journal of Architectural Computing*, 4 (11), 415-436.
> Salama, A., (2008). A theory for integrating knowledge in architectural design education, *International Journal of Architectural Research,* 2, 100-128.
> Smith, C. (1981) A Search For Structure, Selected Essays on Science, Art and History, MIT Press
> Symeonidou, I., (2014). Learning Through Making. Digital fabrication of 1:1 experimental constructions within an educational context, in Proceedings of *International Conference "What's the Matter? Materiality and Materialism at the Age of Computation",* Barcelona, Spain, 836-845.
> Symeonidou, I., (2017). Reinventing Design-Build projects with the use of digital media for design and construction. A survey of 120 educational pavilions, in *35th eCAADe Conference Proceedings, University of Ljubljana*, 231-240.
> Walker C. & Self M., (2010), Making Pavilion, AA Publication, London, UK.

How Future Design Education Can Thrive in an Era of Change

The paper revisits the evolution of design and argues although design has undergone great transformations, its two essential characteristics—being about human beings and performing calculations—have not changed. As a result of series of changes, the discipline of design began to tackle large issues and increase in significance. Design practitioners have evolved the discipline from one that creates style to a way of thinking and acting in which they observe the world, discover and solve problems, create experiences, and add value. Design beame the third driving force of innovation after technology and market (Verganti 2009). The transformation of design from a discipline the goal of which is business innovation to one which prioritizes social innovation and the rise of artificial intelligence are design's two most important paradigm shifts in recent years. the paper summarized the key features of DesignX manifesto released during Tongji Design Week in 2014 that outlines the features of the future design which can be described as following: make use of evidence-based approaches; take advantage of interdisciplinarity to better address the challenges of real-world problems; use algorithms and other tools to deal with complexities, ambiguities, contradictions, and uncertainties; employ relation-based and systematic thinking to link the worlds of nature, human, and artifacts; shift from individual to collaborative efforts, since subjects are becoming more diversified; pursue active design and seek design as investment for the future. Finally, the paper describes five design trends of future education and argues that design schools could become key players in promoting positive changes to create a new economy and a new society.

[change, innovation, future]

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Changeable and Unchangeable

Every milestone in the development of human civilization is closely connected to simultaneously occurring, unprecedented profound changes. In today's rapidly changing era of globalization, issues such as climate change, population explosion, economic crisis, and resource shortages, among others, have forced us to face singular challenges. At the same time, a digitized life style and increasingly flat social and economic structures, combined with globalization, have deconstructed numerous organizational and structural principles in people's daily life, while filling society with various possibilities (Lou, 2011). The COVID-19 epidemic in 2020 has made the uncertainty of humankind's future even more tenacious than previously believed.

A problem's existence indicates a need for a design solution, with different problems requiring different designs. Technological innovations and changes in social organization, how the economy operates, and people's lifestyles give rise to equally profound changes in design as a discipline. Consequently, it is necessary to discuss the definition of design in a space-time "box," i.e., with regard to specific circumstances concerning its where and when.

Historically, design has developed in conjunction with transitions in social economics. The Ancient Greek philosopher Heraclitus said, "the only thing that is constant is change." Design has progressed through different stages: from traditional design in the agricultural era (Design 1.0), to modern design in the industrial period (Design 2.0), to innovative design during the current intelligent network era (Design 3.0). The process of design's development from Design 1.0 to Design 3.0 does not entail the disappearance of traditional and industrial design practices, but rather a dynamic extension of design's connotations, roles, technologies, methods, objects, and procedures. At present, Designs 1.0, 2.0, and 3.0 coexist and play different roles.

Moreover, design's roles, goals, connotations, and methods of design do not evolve linearly, but instead proceed in a up-and-down trajectory. Although some approaches may not appear fashionable at a particular historical moment, they may regain popularity at a future stage in history. The appearance of new technologies, or changes in other external conditions, are likely to give old thoughts new life. For example, technologies like big data, cloud computing, social computing, artificial intelligence, and others have introduced new directions in system design discussions. Similarly, sometimes, society needs time to accept forward-looking ideas. For instance, people did not sufficiently value Victor Papanek's (1971) ideas during his lifetime. Beyond this, even though "physical design" has been widely criticized, it still occupies a central position in most of the practical fields (a common feature of all "practical disciplines"). But no matter how much external conditions (technology, society, the economy, etc.) change, "there is still something immutable about design". That is why the humanities and philosophy are so important to design.

In Mandarin, the term for design, which originated in military affairs is "shè jì," consists of the characters "shè" and "jì." "Shè" means setup or plan, while "jì" means strategy or solution (Xu, 2011). The two characters together mean to "establish a strategy." "Jì" contains the concept of "setting goals" and "guiding processes," requiring planning and calculation (Friedman, Lou and Ma, 2015). Design has two extremely important qualities. First, it concerns people. "Shè" depends upon speaking and doing, not only with reference to oneself, but also with reference to others' actions. Second, calculation is integral to design. Since the appearance of Sun Tzu's *The Art of War* in ancient times to the computers of our days, tools have evolved, but the nature of calculation has not changed. Computers not only provide more auxiliary design, management, and construction tools than we had before, but also have become increasingly intelligent, undertaking more work that previously only humans could perform. For example, parametric design is not only widely used in modeling, but also provides support for designers to solve problems related to complexity and lack of clarity. Combining big data and computing to pursue correlations has revealed numerous insights to us. However, although design has undergone great transformations, its two essential characteristics—being about human beings and performing calculations—have not changed.

From Creating Style to Driving Innovation
Over the decades, design has evolved from "creating style" in the 1950s, to "team-work" in the 1960s, to "human understanding" in the 1970s, to "coordinating management" in the 1980s, to "creating experiences " in the 1990s, and finally to "driving innovation " in the twenty-first century. Enormous changes have taken place over the past 70 years, as the following shifts demonstrate:
- From manufacturing to strategy
- From specialized to interdisciplinary
- From design to design thinking
- From creativity to innovation
- From human intelligence to artificial intelligence

As a result of these changes, the discipline of design began to tackle large issues and increase in significance. Emerging in the late 1950s, design thinking, combined with technological approaches and effective business strategies, created consumer value and market opportunities. Design is now connected to the future of most people and demands deeper, broader, and more complex knowledge than it did before. The expanded role of design makes it a unique engine of innovation. In October 2015, The International Council of Societies of Industrial Design (ICSID) released an updated definition of design, emphasizing it as "a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences" (World Design Organization, 2015). In actuality, the contexts in which we discuss design matter more than its definition. Times have changed along with technological, economic, and social organizing methods. Design must thus also change, adopting new values, new fields, new methods, and new roles. In terms of values, current design practice is concerned with how to pursue both humankind's well-being and sustainable development, in particular with how to replace a capitalist economy characterized by chasing profits with a sustainable one of collaborative sharing. In terms of fields, the objects of design have gradually expanded from products and artifacts to relationships, interactions, services, systems, organizations, and mechanisms. In this way, design's role has transformed from a node in the industrial innovation chain to a contributor to the whole field of human existence, while simultaneously attaining a position at the high end of the value chain. In terms of methods, design is now closely related to information technologies (IT) such as the internet, cloud computing, big data analysis, and artificial intelligence. IT greatly improves design's ability to manage complexity, systematicity, ambiguity, and uncertainty. At the same time, design thinking allows design to borrow knowledge and methods from other disciplines such as engineering, management, and anthropology, and to help them to be diffused to fulfill much more human needs. Thus, design thinking facilitates a wide range of inquiry. In terms of roles, design contributes to social and industrial development strategies. Gradually moving out of the role of a passive service provider, design is becoming a driving force for promoting social innovation and leading a new industrial revolution. In this era in which the economy depends upon a network of global knowledge, we can no longer regard design simply as technical work, a service, or a profession. It is increasingly used as a capital investment, which in turn promotes design as a business division in industry. From simple services to integrated strategies with great potential commercial value, design's output has greatly changed over the past several decades. As a result, the employment relationship between design and capital has partially transformed into a cooperative one. Design has the ability to intervene actively in economic and social changes in brand new ways.

Design practitioners have evolved the discipline from one that creates style to a way of thinking and acting in which they observe the world, discover and solve problems, create experiences, and add value. Design is the third driving force of innovation after the technology and market (Verganti, 2009). The transformation of design from a discipline the goal of which is business innovation to one which prioritizes social innovation and the rise of artificial intelligence are design's two most important paradigm shifts in recent ten years.

Next Design: Complex Sociotechnical System Design
As design has experienced a paradigm shift from physical to strategic, it has become an important means for creating a sustainable, human-centered, and innovative society. Design has begun to offer solutions to large problems. While

it formerly provided specific "optimized artifacts," now it proposes systematic "holistic solution strategies" including "objects" and "services" that can enable certain condition (Lou, 2010). As Herbert Simon (1969) states, design is a "course of action aimed at changing existing situations into preferred ones" (p.130). The most fascinating thing about Simon's claim is its optimism. The action of human beings addressing the challenges of their time with the aim of creating a better future is a big design process. Single disciplines cannot address the main problems humankind faces today because those involve complex sociotechnical systems and multiple stakeholders (Norman, 2019). Characteristic of contemporary design are three-dimensional T-shaped innovative and compound educational modes with interdisciplinarity-enhanced vertical knowledge (expert knowledge and abilities) and horizontal knowledge (capacity for broad, integrated thinking) that combine to create an expanded design field, changes in learning methods, and the establishment of values.

At the same time, for design to shift from focusing solely on manufacturing to tackling large problems and systems, it must expand beyond a design tradition characterized by intuition and perception, and develop a new culture. In one attempt to do this, in 2014, the author, in conjunction with several other scholars, issued a manifesto called DesignX that outlines features of the future of design (Norman and Stappers, 2016).

According to our manifesto, new design should:
• Make use of evidence-based approaches;
• Take advantage of interdisciplinarity to better address the challenges of real-world problems;
• Use algorithms and other tools to deal with complexities, ambiguities, contradictions, and uncertainties;
• Employ relation-based and systematic thinking to link the worlds of nature, human, and artifacts;
• Shift from individual to collaborative efforts, since subjects are becoming more diversified;
• Not only proposing solutions, but involved in implementing solutions.
• making progress by "muddling through".

New modes of innovation require us to shed old technology, design, and business paradigms, and implement innovation throughout the entire lifecycles of products. An innovative society not only requires designers to act as problem-solvers in their fields, but also to have the ability to engage in dialogue and interact with experts from a broad range of disciplines and fields. Design education must change accordingly. Design schools should actively participate in processes that use design as a tool to address the challenges of today's world. As the role of design changes, the boundaries between designers and operators become blurred.

Designers cannot just provide solutions, but must become part of the solution. Meanwhile, the subjects creating design now include not only professional designers, but also all kinds of people. As a result of social innovation, the era when everyone designs has come (Manzini, 2015). This transformation is a rare opportunity for the development of the design as a discipline.

Future-Oriented Design Education
In the 1940s, several leading scholars laid the foundation for education in architecture and design at Tongji University. First among them, Professor Huang Zuoshen, Walter Gropius's first Chinese student, systematically brought the ideas of the Bauhaus School to Shanghai. At the time, a banner hung on the campus building in 1950s:
New architecture is ever progressive. It changes according to objective conditions and represents the progress of history. New architecture is ever progressive and not allowed to stay in the historical past. (achieve of Tongji University)
This statement from more than half a century ago vividly presents the unchanging truth about change, and it still holds true today. The reason Bauhaus was so significant is that it synchronized itself with the pulse of the first industrial revolution. It is conceivable that if Gropius and his colleagues were to establish a design school today, it would not resemble Bauhaus, but would closely connect to the current industrial revolution linked to the rise in digital technology and to other global issues. Looking ahead to the development of design education in the future, we can clearly discern the following trends:
1. Waves of innovation across the globe will contribute to the transformation of design education. The history of modern design is closely connected to the first industrial revolution (1760–ca. 1840). If we examine the waves of innovation that have swept the globe since then, we see: mechanization; steel and railways; electrification; chemistry and automobiles; aviation and computers; biotechnology and information technology; sustainable development; Artificial intelligence—one right after another. On the one hand, design has become a powerful tool for promoting the transformation of technological inventions that affect society, the economy, and lifestyles. On the other, every wave of innovation constitutes a new application scenario for design. The core technology of every innovation wave also provided new methods and tools to iteration design, both as a profession or discipline. Computers, information network technologies, and sustainable innovation strongly influence design, and the development of a new generation of artificial intelligence will profoundly affect future designs. Future design education must actively adapt to and embrace these changes, break disciplinary barriers so as to link knowledge from multiple fields, and use new design concepts and methods to face new design objectives and new scenarios for design applications.
2. The future industry and its changes present new requirements for design professionals. The world is currently experiencing a time of unprecedented industrial

change. The designers we need now are not only those who can keep pace with the current industrial revolution, but also trendsetters who can lead the revolution. Bauhaus was the result of the first industrial revolution, but it did not cause that revolution. By contrast, new design may possibly become the core driving force behind the creation of new industries and a new economy. Future design education must not only cultivate greater numbers of industry elites with greater sophistication than previous generations, but also leading figures with forward-looking thinking, all-encompassing visions, and integration capabilities, as well as researchers who can develop new knowledge, design paradigms, theories, methods, and tools.

3. The major challenges humankind faces have forced design education to alter its goals and methods. Sustainable development problems made apparent by environmental, energy, and equity issues have become a common topic in a global community concerned with creating a shared future. The traditional standards for evaluating design, such as whether it is human-centered, attains business success, and so on, cannot meet these new challenges. (Whitney & André. 2020) The current COVID-19 epidemic sweeping the planet has subverted many common perceptions about society, for instance, active human-to-human interactions always been regarded as a goal of public space design. Now the awareness of social distance everywhere provides a new perspective for public design. Design increasingly needs to develop the ability to deal with brand-new, complex socio-technological systemic problems, and also to develop a situationist design value system, which would entail choosing design intervention methods based on the core contradictions we face as a global society. Innovative technologies, such as the new generations of data technology and artificial intelligence, help people to break through the limitations of intuition and realize system-level insights and deductions that affect the future, and assist in decision-making processes.

4. Design education cannot develop without a vision for education as a whole. The common characteristics of global educational reform are at play in reforms to design education, with innovations in higher education topics in the transformation of design education. These include: blurring disciplinary boundaries; transforming means of knowledge dissemination and developing new methods (Weil & Mayfield, 2020); mutual promotion of teaching, research, transformation, and entrepreneurship; lifelong learning beginning in K–12 and continuing through university; online vs. offline learning; flipped classrooms; science, technology, engineering, art, and math (STEAM); project-based learning (PBL); and learning-by-doing. At the same time, design education can and should play a more important role than it does in education reform processes. As a discipline that studies how to create and meet people's needs, design links science, engineering, art, and business, and possesses a unique disciplinary structure and evaluation paradigm. It ought to become a field general knowledge like science and art. As a step in this direction, the College of Design and Innovation of Tongji University established Shanghai Tongji Huangpu Design and Innovation High School in 2015 to extend design education to K–12.

5. In terms of the physical space of design schools, we need to develop new models. At present, the space and composition of mainstream design schools all over the world continue the Bauhaus tradition, consisting of classrooms, workshops, exhibition space, common rooms, and so on, in clearly defined buildings or campuses. This spatial model is not adequate for the creation of future generations of innovative, talented designers. Investigating how to integrate design schools into broad, inclusive, interactive ecosystems is also a necessary step in the development of future design education. Beginning in 2015, through a collaboration with the city of Siping, where the Tongji University's College of Design and Innovation is located, the college successfully established a number of laboratories, makerspaces and prototype stores in the community based on the concept of a living lab. (Lou & Ma, 2019) As of today, spaces that do not belong to the college now account for 40% of its total area, and they play a role in the education of our students that traditional college spaces cannot. They not only fill a gap between students and the real world, but they also enable a greater number of stakeholders than is usual to join in processes of education, research, and innovation transformation, greatly enriching the college's innovative ecology. Tongji University's living lab breaks with the traditional idea that communities are at the end of the innovation and industrial chains. Instead, the community has become an initiating point, providing a source for urban innovation, making use of knowledge, talents, and resources from the university.

As Abraham Lincoln said "the best way to predict the future is to create it." We need to reconsider the goals, knowledge systems, and educational ecosystem structures of design education in the context of industrial and social transformations, in order to adapt to the massive changes occurring in our times. We should regard design, and design education in particular, as catalysts for the transformation of individuals, organizations, and society. Design education should enable students to develop innovative minds that can embrace complexity, nurture possibilities, and drive influential changes, while balancing academic research with design practice. In this way, design schools could become key players in promoting positive changes to create a new economy and a new society, a beacon to light the future, rather than passive adaptors to change. At present, the number of design schools sharing this vision is increasing. As we develop new paradigms for design education, research, and practice, such values as diversity, crossovers, initiatives, responsibility, and tolerance have become core features in the reconstruction of the global ecology of design education.

References

> Weil, D. , & Mayfield, M. . (2020). Tomorrow's critical design competencies: building a course system for 21st century designers. *She Ji: The Journal of Design, Economics, and Innovation.* 2020, 2 no. 6 (Summer 2020): 157-169.
> Friedman, Ken, Yongqi Lou, and Jin Ma. "Shè Jì: The Journal of Design, Economics, and Innovation." *She Ji: The Journal of Design, Economics, and Innovation* 1, no. 1 (Autumn 2015): 1–4.
> Lou, Yongqi. , & Ma, Jin. . (2018). *Growing a Community-Supported Ecosystem of Future Living: The Case of NICE2035 Living Line. Cross-Cultural Design. Applications in Cultural Heritage, Creativity and Social Development.* Springer, Cham.
> Manzini Ezio. *Design, When Everybody Designs: An Introduction to Design for Social Innovation.* Translated by Rachel Coad. Cambridge: MIT Press, 2015.
> Norman, Don, "DesignX: A Future Path for Design," *JND*, last modified August 1, 2019, https://jnd.org/designx_a_future_path_for_design/.

> Norman, Donald A. and Pieter Jan Stappers. "DesignX: Complex Sociotechnical Systems." *She Ji: The Journal of Design, Economics, and Innovation*, 2016, 1 no. 2 (Spring 2016): 83–106.
> Whitney, P. , & André Nogueira. 2020. Cutting cubes out of fog: the whole view of design. *She Ji: The Journal of Design, Economics, and Innovation.* 2020, 2 no. 6 (Summer 2020): 129-156.
> Papanek, Victor. 1971. *Design for the Real World: Human Ecology and Social Change.* Chicago: Academy Chicago Publishers.
> Simon, Herbert A. *The Sciences of the Artificial.* Cambridge: MIT Press, 1969.
> Tzu, Sun. *The Art of War.* Translated by Peter Harris. London: Everyman's Library, 2018.
> Verganti Roberto. *Design Driven Innovation: Changing the Rules of Competition by Radically Innovating What Things Mean.* Cambridge: Harvard Business Press, 2009.
> World Design Organization, "Definition of Design," *WDO*, last updated October 18, 2015, https://wdo.org/about/definition/.

Brainstorming activities in the process of designing industrial products.

The models of training

Over time, training in the field of design has conformed mainly with the contribution of the lines of thought coming from the schools of design, from the artistic movements and from the industrial and economic revolutions of the early twentieth century.

Today, design offers, in the various public or private educational contexts, a multitude of different addresses and specialisations that are characterised and differ considerably - from country to country - due to the cultural, historical, social and geopolitical context.

In the experiences gained in each context, the awareness of an education that requires ever greater skills to respond to the complexities of modern society, has increased more and more.

Some experiences bring greater value to craft and technical skills through an artistic-humanistic approach deriving from experience; others, instead, aim at a rational-scientific approach more orientated to strategic, integrative and experimental skills, in the design of objects.

It is precisely from these differences in interpretation, that the legacy of the two training models that have characterised the history of design can be found: the experience of the Bauhaus and that of the Ulm School. The former model refers to overcoming the distinction between art, craftsmanship and industrial production and aims at the transfer of notions on basic human needs, in order to educate students in the design of products with aesthetic qualities and new languages. The latter, on the other hand, develops a rigorous scientific methodology based on the culture of the project, intended as an integrated and interdisciplinary elaboration of multiple skills, abandoning the idea of design as an artistic activity only.

Even today, it is possible to see how both, the artistic-humanistic approach of the first model and the rational-scientific approach of the second one are present, in an evolved way, in major institutions around the world.

The project outcomes represented focused on three geopolitically different areas: the European context, the American context and the Asian continent.

Mariangela Francesca Balsamo

[didactic model, continents, training]

01

The first experiences
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With the experience of the Bauhaus, both the study and didactic planning for the teaching of design began, thus stimulating other schools and academies to research and return a definition of the discipline with its related training.

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01 Table in three different positions, Gustav Hassenpflug, 1928.
02 The New Bauhaus, Chicago, United States of America, 1937. Photographer: Herbert Matter.
03 Stacking tableware, model TC 100. Hans Nick Roericht, Stapelgeschirr. © -Museum Ulm HfG Archiv. Photo: Wolfgang Siol
04 The student Wera Meyer-Waldeck in the carpentry workshop. Staatliches Bauhaus, Dessau, Germany, 1930. Photo: Gertrud Arndt.
05 Josef Albers with student Hope Stephens, Black Mountain College, North Carolina, United States of America, ca. 1939-1940.
06 Table set for aircraft, prototypes, Hans Roericht, Group E 5 development, led by Professor Otl
07 Aicher, Lufthensa company, 1962-63. Photo: Marcus J. Leith. © HfG-Archive Ulm.
Laboratories, Higher Institute for Artistic Industries - I.S.I.A, Monza, Italy, c. 1922

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Think gallery

01

Experimentation and multidisciplinarity in the European context

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The study programs vary according to the adoption of the training model. Some prefer the conceptual and theoretical character with artistic-expressive design results; others instead are moving towards a methodological path oriented towards critical and participatory design for industry.

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01 In studio, GenerationRCA, Royal College Of Art,, London, UK.
02 Laboratories, I.S.I.A, Monza, Italy.
03 Pick-up, Kerstin Bartlmae, Peter Kövari, Michael Penck. 1963-64. Photo: Wolfgang Siol © HfG-Archive Ulm.
04 Graduation Show 2019, Design Academy Eindhoven, Eindhoven, The Netherlands.
05 Diomedeidæ, School of Design of the Politecnico di Milano, Italy. Copyright © Adriano Alfaro, Daiki Nakamori and Gaetano Mirko Vatiero.

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01

Between freedom and innovation: research in North America

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Training in design, originally influenced by the European models, is characterised, on the one hand, by "free" study programs where students adapt their path to their own interests, and on the other hand, by the merge of academic knowledge with a spirit pragmatic, through experimental research and innovation.

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01 Design Department, Cranbrook Academy of Art, Michigan, United States of America.
02 Pinch vase, Adam Shirley. Design outcome at the "Metal Workshop: Cranbrook for Alessi", 2009. Cranbrook Academy of Art.
03 Study prototypes, "Metal Workshop: Cranbrook for Alessi", Department of metals.
04 Pockets of the Interiors, Gosia Rodek, Parsons New School of Design, New York, United States of America.
05 Frame of the video presentation of the course "User Research. Observation + Interviews". MITidm.
06 Team project: Camper Earth. Reduction of CO_2 emissions and energy consumption in the processing of handmade leather shoes. MITidm.

04

Design between expression and rigor in South America

>

Industry and local cultures contaminate each other. Originally, university courses - especially in some countries which are oriented towards policies more attentive to the resolution of social problems - have been oriented towards the rational and scientific European model. Today a more varied situation arises, with the presence, in some cases in an original way, of the model with an artistic and humanistic approach to the discipline.

02   03

01 Typography Workshop, Escola Superior de Artes e Design- ESAD, Senhora Da Hora, Portugal.
02 Teres. Renata Paraense, Pontifical Catholic University of Rio de Janeiro -PUC Rio, Brazil.
03 The Umbrella, Marìa Teresa Franco, Juan David Garavito, Nicolàs Pinz n. Universidad de los Andes-Uniandes, Bogotá, Colombia.
04 Petrol pump, Werner Zemp, Peter Hofmeister, Franco Clivio, Horst Emundts, Verena Loibl, Edith Ross, 1964-65. © HfG-Archive Ulm.
05 Darwin, self-propelled wheel for bicycles. Universidad de Buenos Aires FADU - UBA.

05

Contaminations and local traditions on the Asian continent

>
Intercultural relations with Europe and America, which took place at different historical moments, favoured the contamination of methods, concepts and interpretations of design.
Both main educational models are present in the vast Asian continent, evolving and diversifying according to the culture, tradition and economy of the place.

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01 Oneware, Loren Lim. National Winner James Dyson Award 2016. National University of Singapore-NUS, China.
02 Transitional Object, Daniel Garber, 2019. Bezalel Academy of Arts and Design, Jerusalem.
03 Ceramics, Margarete Heymann-Marks Löbenstein, 1930.
04 Ulm stool, Max Bill, Hans Gugelot and Paula Hildinger, 1955. Photo: Andreas Reiner
05 Exhibition of industrial design laboratory results. Tongji University of Shanghai.

Think gallery

Make

Making design knowledge democracy happen

This paper's objective is to envision new design teaching and learning systems, offering a vision through the exploration of a model based on the "Research Through Co-Design" (RTC) theory, in order to understand how the model and the related perspectives can improve future design education experiences whilst encompassing equal, peaceful and inclusive societies. We propose a reflection based on the concept of "design knowledge democracy" as a reference point for thinking about innovative training and education systems in design. We argue that contemporary design research should take into consideration the concept of knowledge democracy before embarking on how to train people to be sensitive to design. Therefore, this paper tries to explain how the RTC model can represent a knowledge strategy for envisioning future design education systems based on the RTC theory and the concept of design knowledge democracy. The RTC theory is based on the control system theory and research through design mechanism as a second order cybernetics system. This paper reports findings and reflections discussed in two international conferences where the model was used as a speculative design. During this speculative research process, findings highlighted the opportunity to consider the co-design process in the RTC process as a neural network (a brain) of the system. Therefore, the RTC theory can support the introduction of the design knowledge democracy through the RTC model that can facilitate the building of knowledge strategies for envisioning future design research, education and practice paths. Finally, some implications for new design education systems are also discussed.

[making, research through co-design, design research, co-design, knowledge democracy]

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The design knowledge democracy: an introduction

This paper attempts to envision new teaching and learning systems for the community engaged in design research. Rather than proposing pedagogical models for design education, we offer a vision that explores a model based on the "Research Through Co-design" (RTC) theory (Busciantella-Ricci & Scataglini, 2020) in order to understand how the model and the related perspectives can improve future design education experiences taking into consideration equality, peaceful and inclusive societies.

Recently, experienced authors in design research contemplated «the lack of designers in high-level positions within organizations and government» (Meyer & Norman, 2020), and the role of the design experts in the contexts of diffused design and social innovation (Manzini, 2015) as well as in the new design coalitions and in building a collective design intelligence (Manzini, 2019). These views call attention to the role of design expert with direct implications on training and thus design education. However, is it still appropriate to think about the term of design experts for the future challenges in design and design research? For stressing the meaning of this concept, we propose a reflection based on the concept of "design knowledge democracy" as a reference point for thinking about innovative training and education systems in design. It follows the knowledge democracy concept that recognizes (i) «that knowledge is relational and is represented in diverse forms»; (ii) «the diversity, complexity and holistic nature of often excluded or marginalized epistemologies»; (iii) «the critical role of knowledge in action to make a difference in our lives and of knowledge creation and use as a strategy for social change» (Hall, 2014, 2018). Knowledge democracy has strong relations with the participatory action research (Rowell & Feldman, 2019; Rowell & Hong, 2017) and it is at the opposite of what De Sousa Santos (2007) defined as "epistemicide"; in other words, destruction of knowledge and culture operated by colonialism activity also in his contemporary perspective (e.g. racism, xenophobia, anti-Semitism) (De Sousa Santos, 2016).

We argue contemporary design research should consider these aspects prior to how to train people to be sensible to design itself. What if future design education systems were based on design knowledge democracy? With that said, with this paper, we try to analyse if the RTC model can represent a knowledge strategy (Gaventa & Cornwall, 2008) for envisioning future design education systems based on the RTC theory and the concept of design knowledge democracy.

The RTC theory

The RTC theory is based on the control system theory (Levine, 2011) and the research through design (RTD) mechanism as a second order cybernetics system (Jonas, 2014, 2015); it describes how the RTD process works with a co-design process. In previous works, we designed a collaborative model (co-model) as a «mathematical model of cognitive control that describes the process in doing research with

RTC process» (Busciantella-Ricci & Scataglini, 2020). This model can be useful for understanding how co-creating knowledge through a co-design process in a wider research process as well as taking advantage of processes based on collective intelligence and creativity, in addition to democratic and inclusive processes.

(Why) RTD
RTD is one of the types (Glanville, 2005) or categories (Frayling, 1993) of design research. RTD is «research that recognises its source in design, and which uses the insights and understandings of design in its pursuit» (Glanville, 2005). In the last decades, several authors discussed considerable aspects of the RTD (see Chow, 2010; Findeli, Brouillet, Martin, Moineau, & Tarrago, 2008; Frayling, 1993; Glanville, 2005; Jonas, 2015) taking into consideration the importance in combining research "about" and "for" design in RTD to make it relevant and rigorous (Findeli et al., 2008; Jonas, 2014, 2015). This paper mainly adopts Jonas's reflections on RTD as a cybernetic mode of inquiry (Jonas, 2014); and we see the RTD as «an embodied / situated / intentional observer inside a design / inquiring system, generating knowledge and change through active participation in the design / inquiring process» (Jonas, 2015) where design is seen «as a projective process, human-centered process, innovation process, emancipatory process, political / social process» (Jonas, 2015). And, RTC is based on the RTD as the key foundation.

(Why) collaborative design
The literature that calls into question participative/collaborative design also refers to design research areas related to collective creativity (Sanders & Stappers, 2008), social innovation (Manzini, 2015), participation and democracy (Ehn, 1993), co-creation of knowledge (Garcia et al., 2014) and policy development (Siodmok, 2014). Co-design is a participatory process where people learn from each other (Ehn, 1993). Indeed, «co-design activity produces new knowledge as people develop and experiment with (new) ideas» (Zamenopoulos & Alexiou, 2018). We also recognize co-design as a «mechanism for empowering people, namely a mechanism for taking control over their own futures by developing their own ideas, knowledge and skills» (Zamenopoulos & Alexiou, 2018). In addition, co-design «contributes to democratization and empowerment because it can facilitate the closing of the gap between people who have the power to shape important aspects of their life, such as health, welfare, or built environment, and those who do not» (Zamenopoulos & Alexiou, 2018). Even if collaboration, cooperation, connection, coordination cannot be considered synonymous (see Kozar, 2010), in terms of collective design all four terms «are possible expressions of co-design practices, distinguished on the basis of how strongly they focus on shared goals and working practices» (Zamenopoulos & Alexiou, 2020). In this paper, we talk about co-design only with reference to the term of collaboration, with consideration to people who work together towards a common interest, project and goal (Zamenopoulos & Alexiou 2018, 2020).

(Why) a model for RTC
We designed the RTC collaborative model (co-model) as a "model_for" that is «purposive and therefore essentially cybernetic, intended to allow us to act on that world, to find something out, to see what would happen if» (Glanville, 2005). It enabled us to visualise the RTD with the co-design process as a driver and to speculate the application of the RTC theory in different contexts and fields of knowledge. The co-model uses the control theory of closed-loop systems with a transfer function $G0(s)=G(s)/1+H(s)G(s)$ Golnaraghi & Kuo, 2017) to achieve a research answer $C(s)$ through a co-design process $G(s)$ by issuing a research question $R(s)$. It is possible to determine the error between the obtained research answer and the prefixed research answer through the testing process that is $H(s)$ in the model. Furthermore, the co-design process is defined by the relation $G(s) = (Co*T)/R1(s)$. The co-design process involves two or more co-designers $(Co≥2)$ that apply design methods and use tools (T) thanks to a design question $R1$ for reaching a design answer $C1$.

The RTC co-model as a speculative design
We used the designed model as a speculative design proposal (Raby, 2008) adopting a speculative research approach (Wilkie, Savransky & Rosengarten, 2017) to discuss theoretical aspects with three peer-reviewed papers in two international conferences. Therefore, we presented the RTC theory and its possible application to the field of applied ergonomics and human factors (Busciantella-Ricci & Scataglini, 2020); its application as a logical aid to prepare for a shared scenario of a research process (Scataglini & Busciantella-Ricci, 2020); as a model able to visualize the nature of places such as makerspaces and FabLabs (Scataglini & Busciantella-Ricci, 2019). In this paper, we mainly report reflections and findings we identified for the second conference where we presented a paper on the "makers culture" and on how it can support a novel, more effective and more inclusive learner-centred education. In this case, we used the co-model of the RTC theory linking its variables to the learning activities of the makerspaces. We focused on making and prototyping as crucial activities for intangible design contents (Young, 2008) and complex design domains (see Jones & Van Patter, 2009; Jones, 2014). Therefore, we proposed a theoretical paper that reflects on how it is possible to model the fabrication of intangible things such as knowledge. We identified a possible future scenario where it is possible to consider the makerspace as a co-design process that guides the production of knowledge according to the RTC theory. From this perspective, we proposed the concept of "fab the knowledge" (Scataglini & Busciantella-Ricci, 2019).

Speculating in RTC: lessons learnt
What we learnt from the experiences through the conferences can be summarized primarily with the following aspects about the RTC model: (i) it simplifies the planning of RTD researches through tangible variables; (ii) it can be experimented in different contexts as a speculative design model; (iii) it embeds learning processes

through co-design processes; (iv) it includes nodes (i.e. the co-designers) in G(s) as in neural mechanisms.

The brain of the RTC process: a learning process
Makerspaces or FabLabs can be represented as intangible virtual spaces where co-designers independently of their role and level of education are considered as a precious node in education as nodes in a neural network (Tang, Tan, & Yi, 2007) that act, communicate computing, training and simulating the best set of weights for maximizing the research answer accuracy through a design process in RTC. They are such as computing systems of biological mechanisms (Barrett, Morcos & Macke, 2019) augmenting consciousness, through learning and consequently creating knowledge (intelligence amplification and augmentation). Indeed, human intelligence is, in fact, the capability to accomplish complex goals requiring judgment, creativity, empathy, interaction, and multi-domain expertise. This can be distinguished by the consciousness that it also depends on subjective experience. Each co-designer in RTC presents his own consciousness (e.g. weights in a neural network) that changes based on their experience and domain. In this space, co-creativity is a relational process that feeds on the interactions and involves collective intelligence in finding solutions through the RTC theory. This is a process of discovery, unboxing which requires commitment to education as a process of socialization for democracy.

Envisioning an autopoietic learning system
The system described through the RTC co-model can be seen as an autopoietic system (Maturana & Varela, 1980). Also, the RTC model as an auto/self-regulated system produces available design knowledge by the same entities that learn through the system – through the collaborative processes in G(s). This system can be considered as a sort of autopoietic system for learning design. It embeds educational processes through the same processes described by the variables of the model. The more the collaboration in the co-design process G(s) is constant and exposed on variety and different weights, the more the system can grow through the diversity of the same actors in G(s). This means the RTC co-model promotes diversity and supports equality. One way to apply the model is to transform the needs of a specific context in a shared research question. People can learn through their participation in G(s) and at the same time co-produce new knowledge – in addition to design – that can be adopted in the same system or exchanged with other systems.

RTC as a facilitation for building knowledge strategies
In conclusion, we argue that the RTC theory can support the implementation of the design knowledge democracy through the constructionist RTC model based on co-creation of knowledge and learning experiences. This is because the RTC model can represent a facilitation to the building of knowledge strategies for envisioning future design research, education and practice paths. Of course, we argue the application of this model at a systemic level can stress the traditional meaning of the term design education with a radical constructivist perspective that «strengthens design as an independent field of research, and offers its own, cybernetically informed methods of enquiry and its own forms of rigour» (Herr, 2019). Also, envisioning the application of the RTC model as an education system in design implicates the creation – or better the co-creation/co-construction – of design knowledge democracy movements. And the community-university movements (Hall, Jackson, Tandon, Fontan, & Lall, 2013; Hall, 2014) about design should follow this direction with substantial changes in the design education programmes. Moreover, thinking about the application of the design knowledge democracy as a theoretical concept underlines the impossibility for the design discipline to sign specific boundaries. It means that people interested in learning about design should be able to apply, not just specific skills and competencies but additional values related to system thinking visions, social justice and responsibility, democracy and equality. We argue the designer of the future – if they are to exist – should be able to manage RTC processes for enhancing design knowledge democracy, and by embarking on this type of experience, will be capable of promoting social justice values in order to face significant global challenges. Design education programmes that avoid absolute truths about design and emphasize the diversities of the design cultures are to be expected. Researching, learning and experience in design with the suspension of judgment (*epoché*) for observing the phenomena (Husserl & Hardy, 1999) are also expected. Perhaps, the only way to identify the next design culture is to apply a phenomenological approach in thinking, practising and learning design.

References

> Barrett, D. G., Morcos, A. S., Macke, J. H. (2019). Analyzing biological and artificial neural networks: challenges with opportunities for synergy? *Current Opinion in Neurobiology*, (55), 55–64. doi:10.1016/j.conb.2019.01.007

> Busciantella-Ricci, D., Scataglini, S. (2020). A Co-model for Research Through Co-design. In M. Di Nicolantonio, E. Rossi, T. Alexander (Eds), *Advances in Additive Manufacturing, Modeling Systems and 3D Prototyping. AHFE 2019. Advances in Intelligent Systems and Computing, vol 975* (pp. 595-602). Springer. doi:10.1007/978-3-030-20216-3_55

> Chow, R. (2010). What should be done with the different versions of Research Through Design. In C. Mareis, G. Joost, K. Kimpel (Eds.), *Entwerfen. Wissen. Produzieren. Designforschung im Anwendungskontext* (pp. 145-158). Bielefeld: Transcript Verlag. doi:10.14361/transcript.9783839414637.145

> De Sousa Santos, B. (2007). Beyond abyssal thinking: From global lines to ecologies of knowledges. *Review (Fernand Braudel Center)*, 30(1), 45-89. Retrieved from https://www.jstor.org/stable/40241677

> De Sousa Santos, B. (2016). Epistemologies of the South and the future. *From the European South: a transdisciplinary journal of postcolonial humanities*, (1), 17-29. Retrieved from http://europeansouth.postcolonialitalia.it/journal/2016-1/3.2016-1.Santos.pdf

> Ehn, P. (1993). Scandinavian design: On participation and skill. In D. Schuler, A. Namioka (Eds.), *Participatory design*, pp. 41-77. L. Erlbaum Associates Inc.

> Findeli, A., Brouillet, D., Martin, S., Moineau, C., & Tarrago, R. (2008). Research through design and transdisciplinarity: A tentative contribution to the methodology of design research. In Swiss Design Network (Ed.), *«Focused» Current Design Research Projects and Methods. Symposium conducted at the meeting of Swiss Design Network 2008* (pp. 67-91). Berne, Switzerland.

> Frayling, C. (1993). Research in art and design. *Royal College of Art Research Papers*, 1(1), 1-5.

> Garcia, I., Barberà, E., Gros, B., Escofet, A., Fuertes, M., Noguera, I., López, M., Meritxell, Cortada M., & Marimón, M. (2014). Analysing and supporting the process of co-designing inquiry-based and technology-enhanced learning scenarios in higher education. In S. Bayne, C. Jones, M. de Laat, T. Ryberg & C. Sinclair (Eds.), *Proceedings of the 9th International Conference on Networked Learning 2014* (pp. 493-501). University of Edinburgh.

> Gaventa, J., & Cornwall, A. (2008). Power and Knowledge. In P. Reason, & H. Bradbury (Eds.), *The Sage handbook of action research: Participative inquiry and practice* (pp. 172–189). London: Sage.

> Glanville, R. (2005). A (cybernetic) musing: Certain propositions concerning prepositions. *Cybernetics & Human Knowing*, *12*(3), 87.

> Golnaraghi, F., Kuo, B.C. (2017). Automatic Control Systems, Tenth Edition. McGraw-Hill Education.

> Hall, B. L. (2014). Knowledge Democracy and Ecologies of Knowledge. In D. Coghlan & M. Brydon-Miller, (Eds.), *The SAGE encyclopedia of action research*. Sage.

> Hall, B. L. (2018). Beyond epistemicide: Knowledge democracy and higher education. In M. Spooner & J. McNinch (Eds.), *Dissident Knowledge in Higher Education* (pp. 84-101). University of Regina Press.

> Hall, B. L., Jackson, E. T., Tandon, R., Fontan, J. M., & Lall, N. L. (2013). *Knowledge, democracy and action: Community-university research partnerships in global perspectives*. Manchester University Press.

> Herr, C. M. (2019). Constructing Cybernetic Thinking, Design, and Education. In T. Fischer, C. M. Herr, (Eds.), *Design Cybernetics: Navigating the New. Design Research Foundations* (pp. 153-170). Springer. doi:10.1007/978-3-030-18557-2_8

> Husserl, E., Hardy, L. (1999). *The Idea of Phenomenology: A Translation of Die Idee der Phiinomenoiogie Husserliana II*. Kluwer Academic Publishers.

> Jonas, W. (2014). A cybernetic model of design research: Towards a trans-domain of knowing. In P.A. Rodgers, & J. Yee (Eds.), *The Routledge Companion to Design Research* (pp. 23-37). Routledge. doi:10.4324/9781315758466

> Jonas, W. (2015). Research through design is more than just a new form of disseminating design outcomes. *Constructivist Foundations*, 11(1), 32–36.

> Jones, P. H. (2014). Systemic design principles for complex social systems. In G. S. Metcalf (Ed.), *Social systems and design. Translational Systems Sciences, vol 1* (pp. 91-128). Springer. doi:10.1007/978-4-431-54478-4_4

> Jones, P. H., Van Patter, G. K. (2009). Design 1.0, 2.0, 3.0, 4.0: The rise of visual sensemaking. New York: NextDesign Leadership Institute.

> Kozar, O. (2010). Towards Better Group Work: Seeing the Difference between Cooperation and Collaboration. *English teaching forum*, 48(2), 16-23. Retrieved from https://americanenglish.state.gov/files/ae/resource_files/48_2-etf-towards-better-group-work-seeing-the-difference-between-cooperation-and-collaboration.pdf

> Levine, W.S. (2011). *The Control Handbook: Control System Fundamentals. 2nd ed.* CRC Press, Boca Raton.

> Manzini, E. (2015). *Design, when everybody designs: An introduction to design for social*. Cambridge, MA: MIT press.

> Manzini, E. (2019). *Politics of the Everyday*. London: Bloomsbury Visual Arts.

> Maturana, H. R., & Varela, F. (1980). *Autopoiesis and Cognition: The realization of the living. Boston Studies in the Philosophy of Science, Vol 42*. Dordrecht: Reidel Publishing Company.

> Meyer, M. W., & Norman, D. (2020). Changing Design Education for the 21st Century. *She Ji: The Journal of Design, Economics, and Innovation*, 6(1), 13-49. doi:10.1016/j.sheji.2019.12.002

> Raby, F. (2008). Critical design. In M. Erlhoff, T. Marshall (Eds.), *Design dictionary: perspectives on design terminology*, pp. 94-96. Basel: Birkhäuser.

> Rowell, L. L., & Feldman, A. (2019). Knowledge democracy and action research. *Educational Action Research*, 27(1), 1-6. doi:10.1080/09650792.2019.1557456

> Rowell, L. L., & Hong, E. (2017). Knowledge democracy and action research: Pathways for the twenty-first century. In L. Owell, C. Bruce, J.M. Shosh, M. Riel (Eds.), *The Palgrave international handbook of action research* (pp. 63-83). Palgrave Macmillan. doi:10.1057/978-1-137-40523-4_5

> Sanders, E.B.N. & Stappers, P.J. (2008) Co-creation and the new landscapes of design. *Co-design* 4(1), 5-18. doi:10.1080/15710880701875068

> Scataglini, S., Busciantella-Ricci, D. (2019). *Fab the knowledge*. Paper presented at FabLearn Italy 2019 International Conference, 20th – 22nd November 2019, Ancona, Italy.

> Scataglini, S., Busciantella-Ricci, D. (2020). Toward a Co-logical Aid for Research Through Co-design. In M. Di Nicolantonio, E. Rossi, T. Alexander (Eds), *Advances in Additive Manufacturing, Modeling Systems and 3D Prototyping. AHFE 2019. Advances in Intelligent Systems and Computing, vol 975* (pp 623-634). Springer. doi:10.1007/978-3-030-20216-3_58

> Siodmok, A. (2016). Tools for insight: Design research for policymaking. In C. Bason (Ed.), *Design for policy*, 272-285. Routledge.

> Tang, H., Tan, K. C., Yi, Z. (2007). *Neural Networks: Computational Models and Applications. Studies in Computational Intelligence, Vol 53*. Springer. doi:10.1007/978-3-540-69226-3

> Wilkie, A., Savransky, M., Rosengarten, M. (2017). *Speculative Research: The lure of possible futures*. Routledge.

> Young, R.A. (2008). An integrated model of designing to aid understanding of the complexity paradigm in design practice. *Futures* 40(6), 562–576. doi:10.1016/j.futures.2007.11.005

> Zamenopoulos, T., & Alexiou, K. (2018). *Co-design as collaborative research*. Bristol University/AHRC Connected Communities Programme. Available from Open Research Online - ORO http://oro.open.ac.uk/58301/

> Zamenopoulos, T., & Alexiou, K. (2020). Collective Design Anticipation. *Futures*, 120, 1-13. doi:10.1016/j.futures.2020.102563

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Cultural Resilience Experiments

Cultural Resilience Experiments, as well as being the title of this article, is also the purpose of an elective course for Master's students at the School of Design of Politecnico di Milano, called Temporary Urban Solutions (TUS). During the scheduling of teaching activities for this course, we unexpectedly found ourselves in the midst of a real global emergency due to the explosion of a pandemic that generated a necessity to adapt, to redesign a teaching method investigating social and cultural issues in order to experiment new educational approaches in the field of Design for Social Innovation and prototype new temporary urban scenarios during periods of a pandemic.
In the following paragraphs, attention will primarily be focused on the structure of a new teaching model for the TUS course: a didactic experimentation with cultural and social investigation, translated into analogical visions and digital practices, and conducted remotely through interpersonal connections. Anew methodological and design approach was tested within six weeks, which consisted in rearranging themes and practices already consolidated with the basis of Design for Social Innovation, through the use of new digital and analog tools for co-design activities and the generation of simulations for the prototyping of the final project.
Design Education is always changing. Starting from the awareness that «the experimental approach will become the normal approach in our future» (Manzini, 2015), *Cultural Resilience Experiments* is the result of a new possible educational methodology that reflects on these changes and transforms them into possible new scenarios. Manzini (2015) urged us «to consider the whole society as a huge laboratory for sociotechnical experimentation»: this practice is an example that could be used as a model in the future on a large scale where future designers must be able to manage complex and innovative processes, possess transdisciplinary knowledge, and to combine them in their projects.

[design education, online distance teaching, prototyping, cultural Resilience experiments, design for social innovation]

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The Design Discipline: from present to future

In terms of education, the discipline of design is always changing. Starting from the awareness that «the experimental approach will become the normal approach in our future» (Manzini, 2015), design today is characterized by fluid, evolving patterns of practice that regularly traverse, transcend and transfigure disciplinary and conceptual boundaries. This mutability means that design research, education, and practice are continually evolving.

For most designers, design has no history; it is narrated in the permanent present and if somehow, they are reminded of its history, most designers cannot see any future in this past. Design has never been linked to its wider and more deeply defined temporal dimensions. From a design point of view, time is now; the perfect design is the present. The design has not even managed to deal with its only means of controlling time: asking the question what could it become? Seen in this way, the history of design is captured in different time cycles that are all competing. Rodgers (2017) said:

"to identify the history of design in the present time, it is necessary to look at the origins of design in the way it is as a product of the division of the idea from production. In the common history of design, the most familiar period of time is the simple past, in which design was given the project of producing competitive advantages on the market which, bound by the machine powering, the now globalized cycle of production and consumption".

At the basis of this production cycle there was an almost resolute devotion in material progress that led to Foucault (1971) stating that « we know what we do but we don't do what we know». This investment is fixed in our faith in technological progress, as a perfect future: trust in technological progress connected within a digital network. In order to imagine a feasible future, it has now become necessary to cross the competitive times of digital classification of the past and digital reproduction of the future. Ken Friedman (2019) suggested that:

"these challenges create a new context for the design process. Some forms of design remain similar to what they have long been. Other forms of design emerge in response to new developments, new tools, new situations, and new technologies."

The Third Industrial Revolution allowed for the development of electronics and information technology; these were instrumental in the emergence of the Fourth Industrial Revolution, which revolves around smart manufacturing and the maker movement. Digital platforms and distributed production are becoming increasingly accessible and affordable. They generate a socio-economic shift by changing the processes, know-how and actors involved in designing, producing and distributing contemporary artefacts. With an advanced planning activity anticipated in the 21st century, an increasing number of researchers and professionals in a wide range of creative disci-

plines and other application themes habitually consider their methods to be rooted in the practice of designing, or using methods, techniques and approaches that could be considered "designerly" (Cross, 2006). Consequently, the Design Discipline is constantly expanding, taking on the changes and emerging problems of the world, waterproofing new possible scenarios for the creation of new ideals and tools to be applied in different production systems.

The Design Discipline, with its focus on education, includes various design fields such as product design, graphic design, communication design and design in engineering, etc.. Design refers basically to a problem-solving method, a creative problem-solving approach and relevant processes. Design education has adapted itself to the changing function of design throughout history due to changing consumption, production and competitiveness patterns. At the beginning of the century, and especially during the post war period, design gained importance as the aesthetic element of objects. As the function shifted from pleasure to differentiation, the concern and content of the design problem became diversified. The essential structure is based and focused on inter-changing solutions to problems. Design education has also been responsive to systemic transformations and increasing complexity. Overall, these changes in the discipline have been significant.

Design Education: living with pandemics
Muratovski explained in 2015:

"design is all around us, it influences how we live, what we wear, how we communi-cate, what we buy, and how we behave. Yet designers are rarely invited to participate in the planning of the strategies that determine what kind of design solutions should be developed, for whom, or why".

The world is becoming an increasingly complex place. Negative tensions, such as unsustainable population growth, ageing populations, global terrorism, and increasing pressure between people and technology, are affecting society. Muratovski had previ-ously said in 2012:

"other critical uncertainties such as globalization, natural disasters, environmental impoverishment and global epidemics are still present and will continue to be major problems in the years to come".

These multi-faceted problems require new solutions and unconventional approaches so that we can improve or even maintain our quality of life as it is.

Design is a process. The design process is has a strong foundation and involves theoretical disciplines and fields of practice. Like all fields of practice, knowledge of design requires both explicit knowledge and tacit knowledge. «The challenge of each evolving field is to focus tacit knowledge in an articulated way» (Friedman, 2000). This creates a terrain of

shared understanding on which the field of practice is built. It is possible to explore new methodological and multidisciplinary approaches in increasingly diverse and articulated forms, thus developing new and renewed educational models, giving an interpretation based on an intermediate tool between research and teaching, and the performance of an analogical and digital perspective of cultural, social and cognitive interconnections. Can design look further humanistic and scientific culture to focus on the ability to transform human needs into products that improve life and social relationships? And, what is the role and impact of distance learning within experimental education methods aimed at international students with different disciplinary backgrounds?

Cultural Resilience Experiments: the brief
Pandemics have always shaped cities and Covid-19 is already doing that. From the Plague of Athens in 430 BC, which brought about profound changes in the city's laws and identity, to the Black Death in the Middle Ages, which transformed the balance of class power in European societies, to the recent wave of Ebola epidemics in South Africa, which highlighted the growing interconnection of today's hyper-globalized cities, public health crises almost never fail to leave their mark on a metropolis.

As the world continues to fight the rapid spread of the coronavirus, which is confining many people to their homes and radically changing the way we work and think about our cities, some wonder which of these adaptations will last beyond the end of the pandemic and what life could be like afterwards. The transformation that our cities have undergone in the last months is clear: long panoramas of deserted public spaces, like a film with no sound, no human presence, no traffic, but, primarily, no pollution.

Since we stopped walking around town, have we learned to really listen to it? From the windows of our private homes we collect sounds and smells that our distracted life has never allowed us to hear, and we can enter a fragile and emotional city landscape. Each of us has wondered at least once during this period if the status of isolation was not the right occasion to stop and reflect on the tomorrow that will greet us after this pandemic. We have begun to wonder if and how the trauma of total lockdown will affect all levels of society: in the workplace but also in the sphere of relations and the use of public spaces, particularly in the context of large and medium-sized cities.

The reality is to start thinking about a new possible future. In this context, however, there is a space that has been re-evaluated most of all – semi-public spaces, such as balco-nies, windows and terraces. A revolutionary architectural element that was previously considered a demarcation point of the domestic boundary and that is now the place within the house where the relationship of proximity with neighbours and a connection between private and public space is still possible, indeed somehow stimulated. This was described by Ugo La Pietra (2014):

"the balcony has been revalued by many and considered a stage for relations, from which it is still possible to express, perform and communicate".

Orizzontale, a design collective, immortalized the *balconanza* in one of their drawings for the magazine Domus (1). The term *balconanza* describes this emerging activity of relationships between people from their balconies and terraces. Subsequently, other semi-public spaces of proximity have become involved, starting with the experience of the individual with his/her own apartment and progressively spreading to the remaining condominium spaces: courtyards, stairs, elevators, terraces, etc.
Why not think about collective activities, which, through art, music, cinema, theatre can become a tool to encourage and strengthen the relationship of proximity and solidarity in the neighbourhood?
Cultural Resilience Experiments' brief consists of bringing the concept of city, public space, personal relationships, and collective and performative activities into a private dimension. This can include one's own home, developing new artistic and interpretive forms from disciplines like dance, art, music, theatre, cinema, literature, and culture giving value and using - as an urban temporary stage - the semi-public spaces of one's own condominium: balconies, windows, stairs, terraces, courtyards, elevators, neighbouring streets, etc. Fassi (2012), in his book, *Temporary Urban Solutions*, affirmed that:

"temporary installations, performances and urban actions organised in public spaces have been one response to social, cultural and spatial differences. (...) The city is read as a container of public space".

Different design disciplines were presented via video to students in the first lesson of the Master's course. Each theme was explained by an expert from the Italian artistic and cultural world to present his/her idea of performance in a fragile period where the crisis of culture is still evident today. Among the experts we find Lorenzo Palmieri, a Music Designer; Petra Loreggian of RDS, Base (Milanese cultural centre); Beltrade Cinema (historical cinema in Milan); the architects of Orizzontale (design collective in Rome); Triennale di Milano; Fondazione Castiglioni; and an actor and performer. Following this multidisciplinary artistic and cultural presentation with case studies and analysis of the themes chosen, the course began with this personal vision of the experts, and in this way the students, divided into working groups, chose their theme to be developed in the following weeks, thus giving a new interpretation of the discipline, and how this could be transformed into a collective activity during the period of quarantine.
Design aims to reconfigure spaces through new strategies by modifying the spatial experience, influencing people's everyday life, and eliciting social and behavioural change. As Fassi (2012) says:

"feeling urban space means perceiving a conformation of empty and full, of high and low, of above and below, but also recognising a system of relationships between people who live in these spaces, the neighbourhood and the neighbourhood life, true centres of affective communication".
According to Navarra (2008):

"we find ourselves acting in places which are not usually offered or dedicated, but on the contrary are made available, are lent or temporarily given for a specific use".

The challenge for the students, in addition to relating to a new methodology and the distance learning approach, was to enhance their point of view as to the situation of social distancing and how to transform these disciplines into a cultural and social revitalization. And, also, how these semi-public spaces, in the condominiums, could become important for temporary performance, and how this could express a concept of spatial and service legacy in a near future.

Cultural Resilience Experiments: new teaching methods and new tools
In previous editions of TUS, the methodology used was human-centred, a creative approach to solving problems that generates a deep empathy with the people you are designing for. As IDEO (2) states, «it's a process that starts with people you're planning for and ends with new solutions tailored to meet their needs». It was therefore a question of generating ideas and building prototypes, sharing what has been done with the people you are designing for and also putting new innovative solutions out into the world. By collaborating with different groups of people, you are designing solutions with them, as the central core of the process, and therefore building together, which is more likely to bring about real success. To maintain this community-centred project approach, but due to the impossibility of being able to design physically with people, the methodology was changed in terms of time, educational activities and tools. The students were very active and involved in reinventing new tools appropriate for their projects.
The course included the choice of a single discipline to be developed according to a specific intervention strategy, such as: low-tech impact, analogic impact, offline approach, sensorial experience, and sustainable value. These strategies were then to be completed with project outputs, in terms of space and service, according to a temporary vision and future legacy; as an example: collective activity, remote event, spatial installation and impact, performances, etc.
The phases of the process established through the course, and developed over six weeks, are:
1. Analysis and Research: including a desk research and a field research about the context and the discipline chosen, analysis of case studies, interviews done remotely, and analysis of semi-public spaces;
2. Concept Generation: including creation of scenario, brainstorming session, development of moodboard, and vision project, and set up of 3 personas' profiles;
3. Co-design Session: testing the effectiveness of concept project remotely;
4. Project Development: including creation of project manifesto, choice of project title and effectiveness, creation of key images, spatial journey map timeline (legacy included);
5. Prototyping: including plan of spatial and service prototyping activities in the chosen space, insights from the prototyping activities through a video report.

Due to COVID-19 and the necessity for social distancing, future designers will need to digitally interact with users in a meaningful way that furthers ideation. Some tools and steps of traditional process have been remotely reviewed: students have succeeded through the digital tools mentioned above to transform co-design and prototyping activities, which is a first change in the concept of teaching methods. All lessons during the course for the academic year in the pandemic period were conducted through an online platform. The tools of the traditional process have been remotely rethought, especially with regards to the co-design activity: it has transformed the whole activity to online platforms that are open to a public with different skills, from all over the world, and with different situations lived in such a fragile period who are ready to make their contribution without the problem of distance. The prototyping phase is affected in the same way: for a moment that usually involves a large group of people coming together in a major collective event, rethinking a prototype at a distance was a real challenge. The students engaged in the organization of prototyping simulations using homemade materials and the spaces of their own building, setting up different activities to involve their neighbours, who were rather reluctant given the pandemic situation. The results of these activities when transformed for a remote approach, especially the last two, produced more satisfactory results than expected: more interaction from participants; more attention to detail; more time to organize the activity to be developed; more opportunity for comparison; and more time for participation. Co-design activity takes place when designers invite users to take part in the ideation process because "they value user experience and feel that users can contribute to the overall quality of the design" (Kanstrup, 2012). As Briggs and Makice (2008) said:

"increased information access, global view, ease of networking and increased activism has created non-employees who are becoming a part of the process of value creation with organizations".

But what if you cannot meet in person? What if all communication is done digitally? The students committed themselves to creating working groups that reach different age groups and from all over the world. In addition to using digital platforms that help to support the activity with shared virtual boards without space and time, they had the opportunity to design digital tools for the dissemination of their ideas to obtain more feedback for design developments. Given the impossibility of being able to design physically with people, to create tangible groups with associations and experts, and to form interpersonal networks, the methodology was changed in terms of time, educational activities and tools. Each year, as a conclusive event of the course, a collective classroom exhibition of all the students' is usually organized. Artsteps.com has been tested as a tool to organize a final remote exhibition of these current projects: a free online platform that allows virtual museum space to be created and different contents to be exhibited. Eight virtual museum rooms were created, one for each group, in which visual paths with graphic and video materials were set up to present the various projects. The final tool of this remote virtual exhibition is an overall video of the immersive journey between the final projects of the course.

A starting point for innovative distance education
In this essay, the starting point to the critical challenge of a new reformulation of the educational process of the design discipline is highlighted: a collaboration between teachers-researchers, students as designers, and the sudden cultural crisis due to a pandemic. The role of the teacher, as spokesperson for the discipline of Design and its multidisciplinarity, is to shuffle the cards and rethink through new solutions and new methodologies for a teaching that is constantly evolving. Obviously, the problems faced in this first remote teaching experiment are manifold - due to misunderstandings in logistics, slow connections and different time zones, not having any kind of visual and empathic contact - but the experimentation was stimulating. A new chapter has been opened, reformulating and testing new approaches for the designers of the future, those who will be called to redesign new solutions for cities and for people's, and their own, personal needs.
This article proposes one of the many potential solutions to make a new teaching design method possible, and it is an initial answer to the questions asked at the beginning of the text. But what is yours?

[1] Quarantine's Diary edit by Domus. Retrieved from https://www.domusweb.it/it/notizie/2020/03/16/come-abitiamo-in-quarantena-un-diario-dei-giorni-del-coronavirus.html?fbclid=IwAR1M1ehvVzmEUxEGyuJzopV4NIivjlR6peizLpIKZWS5tzmAlPsBUFJgETg

[2] Design Kit. What is Human-Centered Design? Retrieved from http://www.designkit.org/human-centered-design

References

> Briggs, C., & Makice, K. (2008). *Bricks and clicks: participatory organizational design through microparticipation*. In Proceedings of the Tenth Anniversary Conference on Participatory Design 2008 (pp. 250-253).
> Cross, N. (2006). *Designerly Ways of Knowing*. London, UK: Springer
> Fassi, D. (2012). *Temporary Urban Solutions*. Maggioli Editore
> Foucault, M. (1971). *Madness and Civilization: A History of Insanity in the Age of Reason*. New York, NY: Pantheon Books.
> Friedman, K. (2000). Creating design knowledge: from research into practice. *IDATER 2000*, *1*, 28.
> Friedman, K. (2002). Towards an integrative design discipline. *Creating breakthrough ideas: the collaboration of anthropologists and designers in the product development industry*. Westport, CT: Bergin and Garvey.
> Friedman, K. (2019). Design education today-challenges, opportunities, failures. *Chatterjee Global Lecture Series,* Cincinnati, OH: Ullman School of Design.
> Kanstrup, A. M. (2012). *A small matter of design: an analysis of end users as designers*. In Proceedings of the 12th Participatory Design Conference: Research Papers-Volume 1(pp. 109-118).
> La Pietra, U. (2014). *Ugo La Pietra: Interno-esterno: abitare è essere ovunque a casa propria 1977-2013*. Corraini Edizioni.
> Manzini, E. (2015). Design in the transition phase: a new design culture for the emerging design. *Design Philosophy Papers*, *13*(1), 57-62.
> Manzini, E. (2015). *Design, when everybody designs: an introduction to design for social innovation*. Cambridge, MA: The MIT Press, 2015.
> Muratovski, G. (2012). What is design, and where it is going. *Between Design Journal*, *5*, 44-47.
> Muratovski, G. (2015). *Research for designers: A guide to methods and practice*. London: Sage.
> Navarra, M. (2008). Repairing cities. *Hidden public spaces: when a university campus becomes a place for communities*. LetteraVentidue edizioni, Siracusa.
> Rodgers, P. A., & Bremner, C. (2017). The concept of the design discipline. *Dialectic*, *1*(1).
> Sanders, E. B. N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-design*, *4*(1), 5-18.

Diverse together: learn by collaborating

Historically, academic design education is delivered largely through active and collaborative learning modes, where students - working in small groups - learn to design by designing. Remaining implicit for a long time, the educational practices adopted by teachers today worth to be made explicit, to become an area of study and disciplinary discussion. In the contemporary scenario, active and collaborative learning are confronted with the phenomenon of the increasing cultural plurality of classes, due both to internationalisation processes and to the enhancement of interdisciplinary paths. The practices proposed within Design studios must therefore address the presence of cultural plurality, as an element that enriches the teaching experience but, at the same time, determines greater barriers for collaboration and therefore for learning.

This essay presents three cases of action research in the field of Design higher education in culturally plural contexts. In each case, explicit procedures for the formation of teams of students were defined and, in two cases out of three, a support activity for the teams was provided. The three different approaches were defined according to the peculiar characteristics of the classes and courses. The analysed experiences show that, to maximize the effectiveness of active and collaborative learning, it is important for teachers to explicitly refer to the skills that students should acquire through collaboration in plural contexts so as to encourage the development of students' awareness. Teachers can therefore effectively contribute to the growth of their students in terms of transversal skills – both collaborative skills and cultural sensitivity - by taking a proactive role with respect to the formation of teams.

[collaborative learning, cultural plurality, teamwork, team formation]

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Since several years, the evolution of teaching strategies is moving towards active learning models, promoting the integration of active learning to enrich the traditional structure of *ex cathedra* or "receptive" courses. The core idea underpinning this innovation process is that learning is richer and more effective when teaching activities involve students in doing and then reflecting about their learning (Bonwell & Eison, 1991). Therefore, it is not enough to rely on the typical assumption of receptive teaching that students absorb knowledge simply through listening to a lesson, watching a video or reading a text (Bonaiuti, 2014).

In this regard, Design education, being descended from Architecture and Art and Craft education, turns out to be in the vanguard since it has always largely employed a teaching approach that include active learning of design through practice. In fact, in the context of studio courses, students have always been exposed to learning-by-doing (Tracey & Boling, 2014).

The courses typically called "design studios" or "workshops" are configured as gyms where students experience the design practice, learning to act and think like professionals. This kind of teaching falls within the definition of problem-based learning, which is based on the idea that learning passes through the resolution of a problem initially posed by teachers (Sancassani, Brambilla, Casiraghi, & Marenghi, 2019; Savin-Baden & Major, 2004). When - as in the case of Design - teachers pose problems related to design, we speak more specifically of project-based learning (Savin-Baden & Major, 2004) or design-based learning (Gómez Puente, 2014). Both the teacher-student relationship and, often, the learner-learner relationship are interactive; from one side the teacher follows the development of the project by advising on the different design aspects and, on the other hand, students often work in teams.

It can be said that the design training also integrates forms of collaborative or cooperative learning (Matthews, Cooper, Davidson, & Hawkes, 1995; Panitz, 1999) when design challenges are posed to and faced by groups of students who collectively contribute to the realisation of the project; this approach supports the development of purely disciplinary skills (hard) as well as collaborative and transversal skills (soft).

Collaborative practices and cultural plurality
In the outlined scenario, recent policies in higher education value internationalisation and interdisciplinary paths defining a new horizon for collaborative learning, especially master's degree courses. Here, collaborative learning occurs more and more frequently in courses characterised by a remarkable cultural plurality. The students embedded in these environments have the opportunity to interact and collaborate with groups of individuals plural by age, ethnicity, religion, language, gender, nationality, study background, experiences. Such contact, if carefully guided, can stimulate their cultural sensibility which is a relevant ability both to train contemporary designers (Christensen, Ball, & Halskov, 2017; Gautam, 2012; Lee, Ha, & Fairfax, 2016; Murdoch-Kitt & Emans, 2020) and global citizens. This last achievement can be intended as the broader objective of the internationalization processes themselves.

Albeit the presence of culturally plural individuals creates a potentially favourable condition, evidence shows that plurality is not a sufficient condition to ensure integration processes, inclusion and awareness. Some authors have argued that policies of internationalisation, to be effective, must necessarily be followed up in teaching practices (Spiro, 2014). In this regard, to carefully supervise the composition of working teams in classes that integrate collaborative learning modes, turns out to be essential (Trahar & Hyland, 2011). Teams composition is a crucial factor to ensure that all the students in the class will live a learning experience that include the interaction with culturally plural peers.

This evidence shed a light on the need for teachers to consider and carefully manage the collaborative practices. Coherently, in the field of Design it is important to formalise this knowledge to identify and promote the effective approaches already present in existing teaching practices (Poggenpohl, 2004; Poggenpohl & Satō, 2009; Wilson & Zamberlan, 2015).

Our research interest is oriented to the study of collaborative learning practices in culturally plural design classes, to share and promote the discussion on these topics within the disciplinary context and beyond its borders. Collaborative learning practices, historically rooted in design education and constantly evolving in an increasingly interconnected world, can aspire to contribute to the wider debate about educational innovation and provide concrete strategies to educate global citizens.

As part of this research, this essay aims to discuss methods to manage the formation of working teams, topic often underestimated but highly relevant. Starting from the observation of Trahar and Hyland (2011), the way in which groups of students are formed is the first fundamental step to promote effective integration processes in the microcosm of the classroom.

By adopting an action research approach, the qualitative data collected during the past academic year in three case studies of different ways to form the teams are here proposed and analysed. The specificity of each case is determined by the characteristics of the class which, in our vision, affect the teacher's choices while planning didactic activities - formation of teams included-. These characteristics include the number of students, the type of course and its general structure, the proposed activities, their duration and influence on the evaluation of the course and so on.

First case: suggest and support
The first case refers to the "Product Development Design Studio", part of the first semester of the master's degree in Design & Engineering at the Politecnico di Milano. The teaching is therefore addressed to a newly established class, composed by 38 students coming from different bachelor's courses (mainly in product design and mechanical engineering), from international and Italian Universities (Ferraris & Mattioli, 2020). The course, entirely structured with a collaborative design-based learning approach, was divided into two independent design activities, temporally

sequential and with an increasing complexity. The final evaluation was obtained by making the weighted average of the evaluations of each activity.

In the beginning of the first activity, it was strongly advised by the teachers to compose teams of three or four students that were as heterogeneous as possible - i.e. interdisciplinary and international - but leaving the students free to group up. At the end of this activity, students had the opportunity to change the composition of the teams following the same indications. At the same time, in the beginning of the second activity, teachers started a parallel path, conceived as a seminar, to inform students about the importance of collaborative learning and teamwork to promote the development of soft skills. Subsequently, optional reviews about teamwork for groups were organised and facilitated by a tutor outside the teaching staff. During this activity, the members of the teams evaluated the experience of collaboration, identifying strengths and room for improvement, through discussions in the form of focus groups. Nine out of a total of ten teams participated to this activity, making thus possible to collect qualitative data about the students' experiences.

From the data collected, it emerges that the indications given for the constitution of the groups were respected by eight of the nine interviewed groups. The members of team 4, the only exception being formed exclusively by students from engineering bachelors, encountered some difficulties in dealing with the proposed design activities, having knowledge-gaps on the aspects of aesthetic research and visualisation of the project. «I was proud of our work, but when I started to compare it with that of the other groups I realised that it would take a designer in our group; seeing the projects all together on the same table our project does not seem to be done by a designer» commented a student of the group. These words well represent the extent to which the formation of the team influences peer-learning paths of individual students within the class and highlight the frustration that can arise from the lack of skills required to solve the design issues effectively. The presence of various skills could enable effective peer learning processes.

Only three teams decided to split at the end of the first activity and reformed with a different set-up for the second activity. These teams were slowed down compared to others in the start of the collaboration for the second activity, having to deal again with a phase of alignment. In fact, in most cases the students reported that at the beginning of the teamwork there was a need to dedicate time to mutual knowledge and understanding by aligning with each other on the collaboration rules.

All teams reported an initial communication difficulty caused by language - having to communicate in English - and cultural barriers (Ferraris & Mattioli, 2020). Most groups managed to overcome these barriers but in some cases they didn't. Different approaches to collaboration and conflict management, intensified by communication difficulties, led Team 9 to a deep internal crisis that strongly influenced the effectiveness of their collaboration. Also, during the focus group, the students came to the verbal confrontation, showing the devastating effects of these unresolved issues on the project development and, consequently, on the learning path of each one.

Second case: explain and guide
Parallel to the first case, another newly established class was about to start its first design studio in the Master of Specialisation in Industrial Design for Architecture at POLI.design. This class consisted of 12 students, architects, and interior designers, all coming from international universities and with very different experiences, being both recent graduates and professionals with a long-term working experience. In agreement with the teachers, a seminar was organized to train the teams as part of the first design studio, called Workshop 1, which includes a single collaborative design activity. First, students were introduced to the concepts of hard and soft skills, being informed on how collaborative design activities would allow them to develop both. Then teachers stressed on the importance of forming balanced groups, where individuals had complementary skills. Subsequently, students participated in an activity of individual reflection and representation of one's own skills, used shortly after as a tool to present oneself to the rest of the class and to the teachers. Listening to the presentations of the classmates, each student indicated the names of those they considered complementary to themselves in terms of experiences, skills and attitude. Finally, the teachers formed teams of three students for Workshop 1, considering the indications given by the students and structuring them so that they were as heterogeneous as possible.

At the end of the course, another final activity of evaluation of the teamwork was proposed, concluded with a moment of qualitative narration of the experience in the form of a focus group. It emerged that the preparatory activity made the students aware that the formation of the groups, although managed by the teachers, was based on their initial skills. To have a space to introduce themselves allowed everyone, even the less talkative, to tell about their strengths and weaknesses. The final focus groups showed also that in this case all the teams went through an initial alignment phase, useful to get to know each other and to establish how to collaborate. Similarly to the first case described in some working groups the plurality of disciplinary backgrounds and approaches to collaboration led to conflicts. In one team these difficulties led to serious relational problems generating great frustration in the group. This became clear during the final focus group in which all members of the group reported that they had experienced an extremely negative learning experience. As far as the other teams are concerned, many of them explained that they had perceived and acknowledged the plurality of while interacting with teammates.

Third case: mix and vary
The third and last case is related to the teaching experience in the theoretical course, Design Thinking and Processes, always part of the educational offer of the first year of the master's degree course in Design & Engineering at the Politecnico di Milano. In this case we refer to the teaching experience offered to the 89 students attending a newly established class with similar characteristics to those presented in the first case. This theoretical course has been redesigned providing active learning activities of various kinds: flipped classroom, seminars and collaborative activities (Mattioli

& Rampino, 2020). In the conception of the course, the activities have been designed to create moments of discussion, analysis of case studies and redesign of products by integrating the theoretical knowledge acquired. Since the course included four collaborative activities disconnected from each other and since teachers had to manage a large number of students, they decided to form new random working teams for each activity in the classroom. It should be noted that these activities did not directly affect the final evaluation of the students. At the end of the course, a moment of general evaluation was organised and students where provided with an individual questionnaire through which qualitative feedbacks were collected.

It emerged that the randomised formation of the working groups was perceived as largely positive because the variation of the groups made it possible to get to know the peers, making new friends and creating the opportunity to discuss and collaborate with many different people. «Team activities were my favourite, as we studied the details of the product that allowed us to learn new things and improve social interaction with other people»; «group activities were fun because in group you have the opportunity to know different perspectives»; «I met new friends and improved my language skills (in English)». The students' comments reported here show how this way of forming teams, in this specific context, contributed not only to learning but also to the socialising of first year students. This allowed everyone to get in touch with the plurality of individuals in the class, getting to know each other and creating new bonding.

Recommendations for future teaching practices
The collected empirical evidence shows that short activities with a less weight on the final evaluation allow students to get to know each other, to socialise, and to live teamwork more serenely, by autonomously recognising the positive value of collaboration as learning opportunity. Considering this, the teachers can evaluate the possibility of providing a series of initial activities, shorter and with an appropriate evaluation weight. During these activities students can become familiar with each other before being called to form teams to deal with a complex design problem. Specific paths to make explicit the importance of collaboration in groups made up of peers can support the development of a greater students' awareness, which is necessary especially in culturally plural contexts to promote effective collaborative learning processes.

As the first and second cases demonstrated, starting this type of paths does not prevent from relational problems in the groups, but it rather allows to develop awareness of the importance of collaborative aspects on students' learning. Additionally, monitoring activities by teachers after the formation of the teams allows to support students in understanding the experiences lived, whether positive or negative, making it a learning opportunity. It also allows the teachers to take an active role in guiding students to understand cultural plurality as a value, supporting from below the training of professionals who will be able to fit sensitively into complex local and global environments.

In today's academic context, where teaching and learning has a distinctly international character, the formation of working teams to carry out project-based teaching activities deserves renewed attention from teachers. Plurality can foster the development of cultural sensitivity which is a relevant element for the training of contemporary designers, but it also increases the barriers for mutual understanding within the groups. A greater awareness of learners on the importance of collaborative skills in culturally heterogeneous work teams allows to create a space where the teacher can manage more actively the formation phase of the groups. In this case the students will not experience this management as an imposition, but rather as a way to promote richer, fairer and more inclusive learning paths.

Looking at the evolution of didactics, we strongly believe that innovation can pass through a rethinking of consolidated practices, such as teamwork, especially when they are adopted uncritically. If reconsidered, these practices would benefit from an adequate reflection on their consequences and from the exploration of more suitable ways to apply them in an increasingly interconnected and plural job market, study, and life environment.

References

> Bonaiuti, G. (2014). *Le strategie didattiche*. Carocci.
> Bonwell, C. & Eison, J. (1991). *Active Learning: Creating Excitement in the Classroom*. 1991 ASHE-ERIC Higher Education Reports.
> Christensen, B.T., Ball, L.J. & Halskov, K. (2017). *Analysing design thinking: Studies of cross-cultural co-creation*. CRC Press
> Ferraris, S.D. & Mattioli F. (2020). The Use of English as Lingua Franca in Cross-Cultural Classes: a Case Study. In DS 104: *Proceedings of the 22nd International Conference on Engineering and Product Design Education*. VIA University, Herning (DK).
> Gautam, V. (2012). *Influence of cultural characteristics on designers' approaches-an empirical study*. TU Berlin.
> Gómez Puente, S. M. (2014). *Design-based learning: exploring an educational approach for engineering education*. Eindhoven University of Technology.
> Lee, D.Y., Ha, J.Y. & Fairfax, D. (2016). Cross-cultural design (CCD) learning reflective tool based on UK and Korea's collaborative design projects. *Proceedings of International Design Conference, DESIGN (Vol. DS 84)*.
> Matthews, R.S., Cooper, J.L., Davidson, N. & Hawkes, P. (1995). Building Bridges Between Cooperative and Collaborative Learning. *Change: The Magazine of Higher Learning, 27(4), 35–40*.
> Mattioli, F. & Rampino, L. (2020). An Active Learning Approach for a Design Thinking Course. In DS 104: *Proceedings of the 22nd International Conference on Engineering and Product Design Education. VIA University, Herning (DK)*.
> Murdoch-Kitt, K.M. & Emans, D.J. (2020). *Intercultural Collaboration by Design Drawing from Differences, Distances, and Disciplines Through Visual Thinking*. Routledge.
> Panitz, T. (1999). *Collaborative versus Cooperative Learning: A Comparison of the Two Concepts Which Will Help Us Understand the Underlying Nature of Interactive Learning*. ERIC.
> Penati, A. & Seassaro, A. (2000). *Didattica&Design*. Edizioni POLI.design
> Poggenpohl, S.H. (2004). Practicing Collaboration in Design. *Visible Language, 138–157*.
> Poggenpohl, S.H. & Sato, K. (2009). *Design integrations: research and collaboration*. Intellect Books.
> Sancassani, S., Brambilla, F., Casiraghi, D. & Marenghi, P. (2019). *Progettare l'innovazione didattica*. Pearson.
> Savin-Baden, M. & Major, C.H. (2004*). Foundations of problem-based learning*. Society for Research into Higher Education & Open University Press.
> Spiro, J. (2014). Learning Interconnectedness: Internationalisation through Engagement with One Another. *Higher Education Quarterly, 68(1), 65–84*.
> Tracey, M.W. & Boling, E. (2014). Preparing instructional designers: Traditional and emerging perspectives. *In Handbook of Research on Educational Communications and Technology: Fourth Edition*.
> Trahar, S. & Hyland, F. (2011). *Higher Education Research & Development Experiences and perceptions of internationalisation in higher education in the UK Experiences and perceptions of internationalisation in higher education in the UK*.
> Wilson, S. & Zamberlan, L. (2015). Design for an Unknown Future: Amplified Roles for Collaboration, New Design Knowledge, and Creativity. *Design Issues, 31(2), 3*.

Teaching to think historically in the age of the infosphere

Following the most recent studies on historical simulation games, this essay aims a reflection on academic teaching methods in the history of design in relation to the use of playful simulation. The author, however, does not intend to enter the topic of GBL, rather she wants to indicate the principles of a new model of theoretical-critical training and learning of historiographic methods for university education. The basis of this work is the results of the research that the author has developed since the A.Y. 2015/16 with - and thanks to - the students of the History of Design courses at the University of Florence. The data derived from an initial transversal quantitative study project that the author followed – and performed – on the critical maps written by the students of her history courses. The evaluation of the data that emerged from these works convinced the author of the validity of their use as the core material useful for the design of a historical simulation game on the theme of design. Currently, the project has reached the formulation of a methodological reference scheme which has proved useful not only for the game project but also for all those training / educational activities that have the value of interpretation and study of the past. The aim of this essay is therefore to highlight the phases of ongoing research which, starting from the analysis of recurrent errors made by university students who engage in historical research, has now come to maturity by proposing a historical game as an alternative model of the formation of historiographic skills through the construction of an ad hoc narrative. The essay will address the phases of the work that have proved useful to promote the learning of history through a model of study "in the field" and not only in an abstract and theoretical form, but also aimed at the acquisition of critical skills in a collaborative and interactive way.

[historical simulation games, infosphere, historical thought, problem space, pervasive game]

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Historical thinking: questions of method

What is meant by "historical thought"? A summary and short definition is inevitably summary is necessary to frame the starting point of the method to think historically that the author has set herself as the goal for preparing students of her courses. Because if one thing has emerged overwhelmingly from the analyzed data, it is that of a lack of awareness of the students of the undeniable and irrefutable difference between the knowledge of the content of a historical fact and the procedural knowledge that led to historicize that fact. In fact, according Stéfane Lévesque: "Thinking historically therefore means understanding how knowledge was built and what it means. Without such a sophisticated vision of ideas, peoples and actions, it becomes impossible to judge between competing versions (and visions) of the past" (2008:27).

On this methodological principle which is very "familiar" to the historian tout court (ie the identification of a topic, the creation of a thesis that can be supported by research, then the search for an appropriate set of primary and secondary sources to support the arguments), the fundamental objective of the author's work was to first highlight the errors in the work of students engaged in historical research done mainly on the web, "bring them back"in the original sphere (of content or procedure), identify the most common forms (not in number, but in nature) and finally translate the data into a "narrative" rather than numerical form.[1] The research investigated a large number of students (about 250 per AY), submitting a questionnaire based on multiple, numerical and open-end answers: the initial self-compilation of the questionnaire prepared by the teacher highlighted a "state of made" of the answers / opinions that students consider reliable if found through the aid of the digital tool and allowed to extrapolate, first of all, the students' basic skills, then the system with which they use the data on the web and, finally how it is possible to evaluate the acquisition of skills directly on the network in the direction of greater awareness of the historical themes proposed also with traditional systems. In its evolution, the research has highlighted three central macro-themes.

The first is linked to the use of the network which has proved to be a potentially critical tool for students when it offers itself as a useful space for working directly with primary and secondary historical sources and to work directly on documents. The second is connected to the autonomous compilation of the critical paper which highlighted how the identification of the authoritativeness of the sources places the student in front of great uncertainties which, in turn, demonstrate basic deficiencies in the recognition of digital sources. The subsequent choice of the teacher to compare the students with each other showed how collaboration in itself can become not only a working tool but a real system of "verification" and control of sources.

Finally, the third theme substantiates the teacher's choice of a project in terms of videogame aesthetics, that is, a historical simulation game, not to be understood as a project of the enhancement of knowledge of digital media, and not even as a simple transformation of analog games in digital format, rather as historic content creation, mash-ups and remixes, on certain and uncertain sources. All the sources that turned

out to be false or uncertain, in fact, were inserted in the story as "counterfactual" indications and, therefore, in a space in fieri and not in act respect to real sources. Currently a large part of the scientific literature on simulation (video) games - historical or otherwise - focuses precisely on the study of the possibilities of individual critical processing of the suggestions taken by playing independently.[2]

Use of the network: potentialities translated into errors
The relationship that exists today between historical disciplines and telematic resources is very complex and highlights a series of issues that are linked both to the fundamentals of the discipline –methodological and philosophical – and to historical research as such and its dissemination through teaching.
For a historian, the use of the internet has proved to be a potentially extraordinary tool: it facilitates the work of research by making available to the scholar the usable sources in a faster and more widespread way. Sources are "what a historian identifies as such in relation to a problem" (Minuti, 2015: 8), that is "the congruence with one's own research object [which] obliges the historian to epistemologically" create "his own sources" (De Luna, 1994:25). The sources are the fundamental resources of his work and their heterogeneity is directly proportional to their effective utility. The "difference between a novelist and a historian is that the novelist is free to invent facts [...] while a historian does not invent facts" but follows a procedure that leads back to "an incessant mechanism of transformation of sources from 'potential' in 'effective" (Momigliano, 1984:479) and this means that history is a discipline that bases its scientificity on what we can define "an empirical factual basis" (Vitali, 2004:129), i.e. "on documentable evidence that are formed through procedures accepted by the professional community through a process of critical examination of the sources" (D'Atri, 2006:216).
A procedure similar to that of the jurist because, as the Turin historian Carlo Ginzburg states (in his study of sources as "categories of evidence"), the way in which a source becomes reliable and verifiable is analogous to its "being potentially universal [and] inscribing in a verifiable knowledge regime" (1991:61). The historical identification of the data present on the web makes this type of research very problematic but not for this reason failing: for the historian, in fact, it is necessary that "the documents and testimonies that form the basis of his work are identifiable, stable, unalterable, and as such susceptible to analysis, criticism and interpretation" (Minuti, 2015:2) but the speed, instability and uncertainty with which the sources live in the digital environment" seems to make uncertain the practicability of the historic arguments through the verification of the sources used" (Vitali, 2004:164).
For this reason, if on the one hand one of the fundamental tasks of current historical education remains "the deepening of a critical knowledge of reality" pursued through "the acquisition of techniques or the memorization of reference frames relating to specific areas of knowledge" (Minuti, 2001:4), on the other hand, a historical training must also include the reasoned use of alternative materials offered by the digital world as a "critical possibility" to define the problems to which an answer is sought.

It must, in short, knowing how to orient within the infosphere, that global environment consisting of the totality of information from both the digital world and the more traditional media, or rather "the semantic space consisting of the totality of documents, agents and their operations" (Floridi, 2014:17).[3] In practice, if it is now clear that a large part of knowledge today is – and will increasingly be – produced in the infosphere and if is to be considered anachronisticthe vision of the perpetual crisis of the humanities in relation to the strengthening of scientific ones and above all digital ones, the quantity of digital sources should not be rejected in its entirety as they are digital but should be understood as an enrichment to historical practice. Enrichment in the direction that "the network enhances the need for definition and clarity in the formulation of problems" (Minuti, 2001:8).
The essential work of the author, therefore, in addition to teaching, was to help students to draw on the digital sources to build their own historical narratives on real historical facts by learning to evade false facts and also to make use of existing sources in places other than the web (archives, libraries, foundations also not online), both for a real comparison and because it is a traditional system. The student's position as the most critical consumer of the contents traced online was also stimulated by the teacher's request to provide certain sources (primary and secondary) and through their categories (text, image, film, artifact) and more specific sub-categories (for the text, for example: novel, poem, direct quote from the author, newspaper article, etc.). The main result of this first work on the sources was to initiate the student to a positive form of skepticism towards the data: their historical certainty is not simply given by their publication but, on the contrary, by their comparison which can bring out the point where the source "collapses" into a false fact.
The data obtained in this first phase of research were elaborated by the teacher in conceptual maps with open content (suitable for the needs of critical interpretation "in progress" of cultural design materials), then developed in databases and / or visualization interfaces. These maps tell of "augmented" objects through a historical reading that captures as much as possible the context, practices and design culture along spatial and temporal lines useful for the reconstruction of a problematic space. This term refers to a scenario of spatial problems, that is "a mental map of the choices that can be made to achieve an objective or the various states of the problem" (McCall, 2012:27, nota 11).[4]

Historical narration in a simulation (video)game
A simulation game is basically a game: an artificial conflict or rules-based competition that dynamically simulates one or more real-world systems. The concept "simulation game" is an expansion of the term commonly used to mean complex simulations of mechanical systems of vehicles such as airplanes and racing cars. In this broad definition, historical simulation video games group a large number of computer, tablet and / or console games that represent the past and place the player in historical roles.[5]

The interest aroused by this type of video games is easily explained: they offer engaging, interactive and multimedia representations of the past and actively involve players through multiple modes of communication (visual, textual, phonic and tactile) capable of presenting problems that invite commitment and decision making.[6]

Even if there are still few specific researches on the benefits of simulation games in history education, those carried out in related areas (scientific, technological, engineering, medical and mathematical subjects) have shown significant results on the study of complex systems and on consequences that certain choices made in the microworld of simulation have in the microworld itself and in the physical / real one.[7] All simulation microworlds are governed by rules and players can learn from direct experience how these rules operate by manipulating a single element in the microworld and observing its effects on other elements.[8] It is certain that if the formulation of hypotheses, and their simulation, has good results in the scientific and mathematical fields, where the precision of the rules determines a certainty of the results, the same not happens for non-quantitative but narrative subjects such as history.

If the language of history refers to what "it certainly was", the language of a videogame, on the other hand, tells "what could happen" and generates the so-called counterfactual history, that is, it creates "a narrative that contrasts what our best estimates and evidence suggests it happened in the past" (McCall, 2018). For this reason, a historical simulation videogame depends on the degree of conceptualization of the past on the basis of problem space theory, that is, the reconstruction of scenarios created (told) as a series of problems, both physical and mental. The result is a scenario structured on the possibilities and not on the determination, and therefore a story that is told through the different opportunities that a given historical moment has offered to its protagonists. In this way, the player finds himself in front of a less predetermined and more possible historical scenario, within which the choices he operates as an active playful decision-making process determine a greater awareness of an already immobile "unborn" past, improve skills to identify the constraints and possibilities (physical and mental) that shape human actions and, therefore, develop strategic problem solving skills (McCall, 2012:12).

Understood in this way, the counterfactual history of a historical (video) game is a strategy that allows students to question the classic historically documented narrative, stimulating an exercise in reconstruction and reorganization of information. That is, it becomes a process that Edgar Morin (1990:2) has called "complex thinking" and which integrates, orders, clarifies, distinguishes and gives accuracy to the knowledge of historical facts learned through a digital medium. [9]

By playing inside – and not with – the story

The current state of the research highlights that contemporary teaching of historical subjects can be strengthened with the use of the videogame tool if, however, this is intended as a "agone" for exchange, between teacher and student, of historical-critical investigation reflective and complex in a digital problem space.

This "agone" has a specific playful matrix, one of the two with which J. P. Gee (2013), studying the video game as a test bed for new theories of cognitive development, has divided the indistinct use of games as a learning system. The first matrix, that of edutainment, or GBL, recognizes in the video game a system for producing learning in a fun and easy way; the second, that of serious games, which identifies microworlds in "serious" games that are not necessarily marked by entertainment.

The first point of view concerns games as training or teaching tools whose main purpose is to make the learning process more enjoyable, attractive or accessible. In this case, to achieve a predefined goal - for example the transmission of some information on mathematics, philosophy or some other science not considered substantially playful in itself - the system of the game intended as fun is used, that is, entertainment without any intrinsic connection. to the main content you want to teach. In this case, the play system is considered as a vehicle for entertainment to maximize the effectiveness of teaching.

Instead, the second approach is based on a connection between learning and play that is not only contingent but essential since it recognizes in the use of serious games a learning process useful for illustrating the nature of the subject taught, for transmitting digital activities and knowledge to be poured, then, real. Johannes Breuer and Gary Bente (2010) further pointed out the nature of serious games by separating them from purely commercial games: a serious game is admittedly a game designed for learning, active and open, while a commercial game is primarily developed to entertain. (learning may or may not be evident and / or considered). In conclusion, the author chose the project of a historical serious game as an interactive activity capable of stimulating a critical approach to finding information on the network; this information was then used for the structure of a historical, counterfactual story based on certain and uncertain sources. Finally, the story itself proved useful in strengthening a multimodal approach to history as a critical study.

If one of the fundamental tasks of the teaching of history is "the deepening of a critical knowledge of reality" and not just "the acquisition of techniques or the memorization of frames of reference relating to specific areas of knowledge" (Minutes, 2001:4), this research feasibly highlights how the contemporary teaching of historical subjects can be strengthened with the use of the videogame tool, if understood as a training ground for exchange, between teacher and student and as an exemplary interactive activity. This activity enhances, in based on the possibilities offered, the sharing, comparison and practical application of known and to be known historical data.

[1] For the foundations of social research, cf. the guide by Martyn Denscombe (2014); for the application of social research to the study in question, cf. the previous essay by Patti I., Vita R. (2017).

[2] Jeremia McCall is one of the most active scholar of historical simulation games and author of numerous essays on the subject: in the 2011 book, *Gaming the Past*, he elaborated the first practical guidelines for conceiving, designing and implementing a history video game. He is also responsible for specific focus on the "simulation and learning videogame" comparison.

[3] The term "infosphere" refers to the entirety of the information space, understood both as cyberspace (Internet, digital telecommunications) and the classical mass media. Cf. Luciano Floridi (2014), an author who in this direction explores the boundaries between online and offline life, highlighting an increasingly seamless connection of individuals, an onlife, which is making us progressively become an integral part of a global "infosphere".

[4] This concept has no implication with physical space and was coined within the cognitive research of videogame systems. See, Jenkins H., Squire K. (2002).

[5] On the types of video games: Salen and Zimmerman 2003, 452-458 and McCall, 2011, 1-4.

[6] The J. P. Gee's work (2013) has the merit of having disseminated this issue to the general public. For the motivational aspects of video games, see also Rosemary Garris, Robert Ahlers, James Driskell (2002).

[7] For studies on the incidence of video games in learning in other sectors, cf. Moreno, Mayer 1999: 358-368; Mayer, Mautone, Prothero, 2002: 171-185.

[8] Cf. Monaghan, Clement, 2000: 311-325; Kordaki, 2003: 177-209.

[9] Cf. Morin, 1990, 2.

References

> Breuer J., Bente G. (2010). Why so serious? On the relation of serious games and learning. In Journal for Computer Game Culture, 4 (1), pp.7-24.
> D'Atri S., (2006). Insegnare e apprendere la storia con il computer. Available on www.academia.edu (consultato il 24 novembre 2019).
> De Luna G. (1994). L'occhio e l'orecchio dello storico. Le fonti audiovisive nella ricerca e nella didattica della storia. Torino, Einaudi.
> Denscombe M. (2014). The Good Research Guide. For small-scale social research projects. Fifth Edition. Glasgow: Open University Press.
> Floridi L. (2014). La quarta rivoluzione. Milano: Raffaello Cortina Editore.
> Garris R., Ahlers R., Driskell J. (2002). Games, Motivation, and Learning: A Research and Practice Model. In Simulation & Gaming 33, n. 4, 12/2002: 441-467.
> Gee J. P. (2013). Come un videogioco. Insegnare e apprendere nella scuola digitale. Raffaello Cortina: Milano (ed. or. [2003, 2° ed. 2007]. What Video Games Have to Teach us about Learning and Literacy. New York: Palgrave Mcmillan).
> Ginzburg C. (1991). Il giudice e lo storico. Considerazioni in margine al processo Sofri. Macerata: Quodlibet.
> Kordaki M. (2003). The Effect of Tools of a Computer Microworld on Students' Strategies regarding the Concept of Conservation of Area. In Educational Studies in Mathematics 52, 2.
> Jenkins H., Squire K. (2002). The Art of Contested Spaces. In Lucien King, Game On!. London. U. K.: Barbican Press.
> Lévesque S. (2008). Pensare storicamente: educare gli studenti del XXI secolo. Toronto: University of Toronto Press.
> Mayer R., Mautone P., Prothero W. (2002). Pictorial Aids for learning by Doing in a Multimedia Geology Simulation Game. In Journal of Educational Psychology 94, 1 (marzo 2002).
> McCall J., Work J. (2011). Gaming the Past: Using Video Games to Teach Secondary History. Routledge: Taylor & Francis Group.

> McCall, J. (2012). Navigating the Problem Space: the Medium of Simulation Games in the Teaching of History. In The History Teacher, 2012/45.
> McCall J., Chapman A. (2018). Who Am I? Am I Doing Here? Player Agents in Historical Games. Available on: https://gamingthepast.net/2018/12/30/who-am-i-what-am-i-doing-here-player-agents-in-historical-games
> Minuti R., (2001). Internet e il mestiere di storico. Riflessioni sulle incertezze di una mutazione. In Cromohs, I.1, p. 8. Available on: http://www.cromohs.unifi.it/6_2001/minuti/I.1.html (consultato luglio 2020).
> Minuti R. (2015). (a cura di). Il web e gli studi storici. Guida critica all'uso della rete. Roma: Carocci.
> Momigliano A., (1984). Sui fondamenti della storia antica. Torino: Einaudi.
> Monaghan J., Clement J. (2000). Algorithms, Visualization, and Mental Models: High School Students' Interactions with a Relative Motion Simulation. In Journal of Science Education and Technology 9, no. 4, Dicembre.
> Moreno R., Mayer R. (1999). Cognitive Principles of Multimedia learning: The role of Modality and Contiguity. In Journal of Educational Psychology 91, no. 2 (Giugno 1999).
> Morin E. (1990, 2005). Introduction à la pensée complexe; trad. Monica Corbani, Introduzione al pensiero complesso, Sperling & Kupfer, Milano 1993. Salen K., Zimmerman E. (2003). Rules of Play: Game Design Fundamentals. Cambridge, MA: Massachusetts Institute of Technology Press.
> Patti I., Vita R., (2017). "Mu.Sa Method. Multimodal System Approach to the Learning of the History of Design". In The Design Journal, 20:sup1, S4774-S4777. Routledge, Taylor and Francis:UK.
> Patti I. (2020). "A good procedural rhetoric for good gaming practice". In Tosi F., Serra A, Brischetto A., Iacono E. Design for inclusion, gamification and learning experience. Franco Angeli: Milano, pp. 231-240.
> Vitali S., (2004). Passato digitale. Le fonti dello storico nell'era del computer. Milano: Mondadori.

Procedural artifacts for design inquiry

In uncertain times, we move beyond normalized ways of knowing to the generation of knowledge through design inquiry. During an inquiry, procedural artifacts perform different social, conceptual, and ontological functions – varyingfrom ideating and prototyping products for the market.Procedural artifacts have inter- and transdisciplinary intentions and tend towards openness and question raising through being "beautifully unfinished" prototypes. Therefore, they are ideal for a collaborative mode of design that is able to deal with uncertain times while creating discourse and action around probable, possible, and preferable futures.Moreover, the diverse functionalities of procedural artifacts enable them to facilitate and encourage new combinations of experiential, practical, and theoretical knowledge and, hence, generate new situated knowledge. Consequently, procedural artifacts challenge modes of articulation between forms of thought, perception, action and production especially in their ability to act as bonding and boundary objects.

In this paper, we propose a framework that sheds light on the diverse functions of procedural artifacts. This framework was used in order to analyze three student projects in a Master in Eco-Social Design, generated during the COVID-19 lockdown in Italy. The outcome of this analysis demonstrates how procedural artifacts challenge existing ways of knowing by applying diverse functions and, thereby, co-generate new forms of knowledge in different social settings. Their ability to reproduce knowledge, their potential for enabling discourse and transformative behavior help to navigate better in uncertain times while moving towards more sustainable, preferable futures.

[procedural artifacts, eco-social design, ways of knowing, preferable futures, design education]

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Framing procedural artifacts

In the discipline of design, artifacts and products have a long history. There are products resulting from a conventional design process to fulfill consumer needs through purchase or within product-service systems. Besides products as final outcomes, there are artifacts generated in different stages of the design process that help the inquiry through deepening the knowledge of a designer, communicating knowledge to other actors involved in the design process, or co-generating new knowledge.As the discipline of design is undergoing a transformation towards being more interdisciplinary to help tackle complex issues embracing multi-level perspectives, this collaboration brings new challenges, therefore new tools and methods need to be integrated into designto fulfill these emerging needs. In this collaborative mode of designing, artifacts perform different social, conceptional, and ontological functions to inform the designer or researcher in developing the inquiry. We consider these prototypical, "beautifully unfinished" materializations as procedural artifacts that evolve through the different stages of the design process to inform the design brief and the final materialized «enabling» solution (Manzini, 2015).

The authors' perspective is informed by teaching and researching about Eco-Social Design at the Free University of Bozen-Bolzano. This emerging sub-discipline of design embraces diverse design approaches such as eco-design, social design, design for social innovation, transition design and transformation design (Fuad-Luke, 2002; Margolin & Margolin, 2002; Manzini, 2015; Irwin et al., 2015; Burns et al., 2006) and aims at triggering processes of social change towards «preferable futures» (Hancock &Bezold, 1994; Dunne & Raby, 2013)[1]. We explore educational experiences using procedural artifacts in various social settings in the Alto Adige-South Tyrol region with a special focus on the period of the COVID-19 crisis in which collaboration has shifted from the physical environment to digital platforms.

The power of procedural artifacts in uncertain times

Currently, we are facing uncertain times with fast-changing parameters and complex, dynamic interrelations. Uncertainty is manifested and amplified through the interaction of phenomena such as the COVID-19 pandemic, climate change, and the digitalization of everyday life. Whole sectors of the economy are collapsing, while others re-orientate towards new visions. As design researchers and educators, we need to reposition our practice by offering tools, methods, and frameworks to our students to help them deal with these dynamics while better enabling others to navigate these complex and uncertain times.

Design, as the materialization of artifacts, creates new images of thought (Hroch, 2015). In the design process, the anchors of thought help focus on particular aspects and communicate complex issues in a «designerly way» (Cross, 1982) making explicit and implicit knowledge accessible. Procedural artifacts fulfill diverse

functions focusing on inquiry, encouraging discourse, facilitating re-orientation, andencouraging action (Fuad-Luke, 2020). Comparing the functions of products for the market with the functions of procedural artifacts, we observe that the former category includes functions that are normalized, unambiguous, and aim towards getting the maximum use-function. In contrast, procedural artifacts bring together different world views, assumptions, knowledge, and ways of knowing in order to question what is normalized – and therefore to challenge the social, conceptual, and ontological norms.

Synthesizing functions of procedural artifacts
Procedural artifacts embed a random and eclectic aesthetic – they are "beautifully unfinished"– due to their, often, temporary roles in the design process. However, they need to be also "designed" in order to convey the intended message and be intuitive enough to be grasped by the participants, collaborators, and users. If designed well, procedural artifacts are able to make uncertain or ambiguous aspects more certain and visible or show contradictions which are not graspable at first glance. Procedural artifacts help people deal with growing local, regional, national, and global complexities thus(Schubert & Ugur Yavuz, 2020), potentially, having an impact on personal, community, and societal change. This is important as we need to be adaptive to the «multiple social worlds» (Star & Griesemer, 1989) in order to generate«enabling artifacts» (Manzini, 2013) to make this change happen.

Another important quality of procedural artifacts is the demonstration of possible futures in the form of utopian or dystopian visions through speculative inquiry, in which artifacts function as a medium to open debate and critical thinking between «actual and possible worlds» (Wakkary et al., 2015). These material speculations help us to ponder about our «preferable futures» (Hancock & Bezold, 1994). Procedural artifacts, therefore, function as instruments with which to navigate or to reduce complexities and uncertainties through involving multiple stakeholders in shaping their own futures through facilitated and collaborative processes (Ugur Yavuz et al., 2017).

Alternative Ways of Knowing
To deal with complexities and uncertainties we need alternative ways of knowing. A too narrow way of thinking is not sufficient to dive into these complexities to comprehend them. It needs a new combination or hybridization of knowledge, described by Barnard et al (2015) as a major strength of artistic and design-driven innovation. We see knowledge as explicit, implicit, embodied and, therefore, always situated[2].

One important facet of knowledge interwoven into the artifact through the process of materialization is the implicit or so-called tacit knowledge (Polanyi, 1958). Extending Polanyi's understanding we can see tacit knowledge in procedural artifacts is embedded through practice and knowledge that is experiential and embodied (Wilde et al., 2017). The different ways of knowing inform and support the design process to approach different actors, partners, and participants, by involving them in the inquiry in various social settings. As students' projects of Eco-Social Design are in diverse social settings with different actors this also generates different forms of situated knowledge (Haraway, 1988). These (re-) combinations of ways of knowing in materialized forms challenge what Ranciere (2000) termed the «distribution of the sensible», that is the modes of articulation between forms of thought, perception, action, and production, and, hence, question multiple futures.

Building Inter- and Transdisciplinary Bridges
Through the openness and adaptability of procedural artifacts, diverse audiences with different social backgrounds can be involved in the design process. The procedural artifacts bridge individual differences and needs of the actors, stakeholders, and participants but also deal with the constraints or possibilities of the context. They are co-generated through allowing people to insert their point of view and knowledge while collecting and at the same time conveying this knowledge. Thus, it is a mix between projecting one's images of thought and understanding to provide anchors of thought for the self and others. These co-created objects and prototypes serve as bonding artifacts (Schubert, 2020). Star and Griesemer (1989) identified these as «boundary objects» which can bundle «central tensions» (ibid.) between the allied backgrounds. These bonding artifacts facilitate inter- and transdisciplinary dialogue, both of which involve an understanding, which is «demonstrated of at least two disciplinary competencies» but where none of the disciplines are primary, resulting in a «trans-methodological perspective» (Bremner & Rogers, 2013). Inter- and transdisciplinary knowledge is exchanged, supported by the material dimension, building empathy while expanding individual and collective perspectives.

Teaching in uncertain times
In our Master course students from the sub-disciplines of design (product, communications, etc.), get mixed up with journalists, sustainable scientists, social entrepreneurs, and others to work on projects tackling social, political, ecological issues mainly in the local setting of Alto Adigebut also engaging in global concerns. In the second semester, they develop a project with a partner from public, social or commercial sectors opening up to transdisciplinary perspectives by collaborating not only with regional entities but also with initiatives from Italy, Austria, and Germany. This requires a collaborative, inter- and transdisciplinary approach while offering new synergetic experiences for the students.
Moreover, this year the students had to overcome the complications of the COVID-19 lockdown restrictions putting emphasis on online collaborations rather than in situ.

This placed a new challenge to educators to let the students continue or nourish the collaborations in a pure digital semester. We as educators, see one quality in design, the adaption to the outside context, which was this time not an aim of a project, but the challenge of the overall teaching approach, especially in practice-based classes. Although many forms of materialization were transformed into digital media, procedural artifacts were a stable factor to raise intense discussions and keep the tangible knowledge exchange still possible. We present three different procedural artifacts developed by our students in various stages of their design inquiry.

We developed a three-level knowledge radar chart (theoretical, practical and experiential knowledge) to evaluate these three artifacts in collaboration with our students. The chart helped to reflect on different knowledge types that a procedural artifact can generate(Polanyi, 1958; Haraway, 1988; Barnard et al., 2015; Wilde et al., 2017). Besides the knowledge chart, we analyzed the three procedural artifacts based on their function, social level, and the role in the design process.

Connecting theory and practice
One format we developed in our Master course is the "Reading and Designing circle" aiming at combining theoretical knowledge, with practical exercises, but also bringing educators from theoretical based courses, as social sciences or cultural anthropology together with practice-led courses, as design and production or social interaction design. After we addressed the topic of boundary objects (Star & Griesemer, 1989) from the social science as well as the design research perspective, the students were asked to apply the theoretical knowledge by developing a boundary object. One of the team outcomes was a fictional artifact in the context of a communal place used by different actors. For dealing with conflicts, the students Caterina Laruccia, Dina-Marie Richert and Nicholas Rapagnani developed different glasses which symbolize a change into another person's perspective aiming at creating more empathy for opposite attitudes.

Through this kind of exercises, students learn that it is easy to convey their ideas by enacting with artifacts. Due to the digital teaching, only materials that were found at home were used and integrated, and even with improvised materials, the intention behind the concept can be presented in a convincing way. Moreover, the physically lived experiences through procedural artifacts not only help the students convey their ideas in a more intuitive way but also become anchor points to build their newly learned knowledge.

Table Mats as in-between artifact
In one of the partner projects with Bio Südtirol, the students Giulia Fasoli and Tom Semmelroth aimed at developing a new procedural artifact to collect information from their target group – seasonal agricultural sectorworkers, in spite of not being with them physically because of the lock-down. The students created a table mat which was integrated into a canteen setting where the workers have lunch. It embraces questions in forms of games to scribble on the mat during or after lunchtime. It was digitally designed by the students, printed and placed in the location by their project partner. Through this artifact, they managed to collect information in a more subtle and engaging way, without creating alienated objects for inquiry but an artifact integrated into the context. The artifact becomes a physical touchpoint between the designer and the target group and brings them into an asynchronous dialogue coping with the lack of physical presence.

Discursive Artifacts "Strg-n"
As part of her master thesis about "Digital-Anarcho-Feminism", Alena Dziedzitz developed a speculative scenario: what if, from one day to another the internet with all its infrastructures and algorithmswould collapse. The command "Strg-n" means "open a new file" – so the internet should be imagined having a complete restart, which would also mean, that new beginnings are possible. Thus, citizens are able to get more sovereignand can decide on their data. Manifold scenarios are possible. To make the highly complex topic of digitalization and data sovereignty accessible, she designed three procedural, discursive artifacts: the first, for consciously sharing your data, e.g. with your local municipality, the second for storing the data at a save and independent space, and the third, for deleting the dataunrecoverable. These complex, digital, and immaterial functions get materialized to an embodied experience: to pull, to spin, and to rotate the buttons by hand.

Final thoughts
The intention of this paper is not to create a higher number of unnecessary artifacts (Papanek, 1971), but to highlight the potentialities of materialization during the design process. Through the suggested framework, we want to show how procedural artifacts generate different types of knowledge and how this might disturb our perception towards new sensibilities and futures. The artifacts challenge the «distribution of the sensible», as they are changing modes of thought, perception, action, and production (Rancière, 2000).

New sensibilitiesare even more important in times of uncertainty, as in the current COVID-19 situation. In these uncertain times, the ability to generate experiential knowledge through artifacts helps us embrace multiple voices and alternative ways of designing as shown with the three students' works.Procedural artifacts are open, flexible, adaptive, and convivial (Illich, 1973). The materialized dimension of the artifact enables the participatory action research (PAR; Martin & Hanington, 2012) in a designerly way. The artifacts permit a co-designing of contextual understanding through mutual learning (Fuad-Luke, 2007).Thus, the transformative potential of PAR can unfold.

The goal of the framework (functions, knowledge, social level) aims towards an increased awareness of procedural artifacts with all their potentialities. The unfolding of functions offers a more intentional and conscious usage and should help to integratethose artifacts into the specific phase of the design process when needed. Thereby, a higher individual and collective perceptual change can be triggered. Through the potentiality of the reproduction of knowledge(s), new ways of knowing can emerge. In emergent situations, as in uncertain times, it is even more relevant, because we need to move beyond fixed ideas and products and elaborate more on the new in-between way of thinking. This brings us a perceptual shift by moving probable futures towards preferable ones.

[1] Hancock and Bezold (1994) in their classic paper on the different types of future of the healthcare system raise the notion of probable, possible, and preferable futures. Probable futures refer to what will "likely" happen – present situation, business-as-usual, likely trends & future development; possible futures refer to what may happen – everything we can possibly imagine, no matter how unlikely, including "science fiction"; preferable futures refer to what we "want" to have happened – "prescriptive futurism" or "normative forecasting", visioning what could be. Their «Types of Future» diagram was incorporated into the design literature by Joseph Voros in 2001 cited in Dunne and Raby's book, Speculative Design (2013).

[2] In her much-quoted paper, Situated Knowledges (1988), Haraway challenges the facts, artifacts and power structures of scientific knowledge claiming, from a feminist perspective, that the veracity of «situated knowledges» generated from an embodied, feminist objectivity derives from knowledge of limited situations but that also «allows us to become answerable for what we learn how to see». In this sense, situated knowledge challenges the power structures of knowledge.

References

> Barnard, B., van Dartel, M., Beekman, N., Lindeman, K.P., Nigten, A. (2015). Artists and designers as agents of change. Paper presented atParticipatory Innovation Conference,The Hague: The Hague University.
> Bremner, C.,& Rogers, P. (2013). Design Without Discipline, Design Issues, 29(3), The MIT Press, 4-13.
> Burns C., Cottam, H., Canstone C., Winhall, J. (2006). Transformation Design. Red paper Journal, 2, Design Council, 1-33.
> Cross, N. (1982). Designerly Ways of Knowing. Design Studies Journal,3(4), 221–227.
> Dunne, A. & Raby, F. (2013) Speculative Everything: Design, Fiction, and Social Dreaming, Cambridge: The MIT Press.
> Fuad-Luke, A. (2002). The Ecodesign Handbook. London: Thames and Hudson.
> Fuad-Luke, A. (2007). Chapter 2: Redefining the Purpose of (Sustainable) Design: Enter the Design Enablers, Catalysts in Co-design, In J. and N. Gant (contributing Eds.)Designers, Visionaries and Other Stories(pp.18-52), London: Earthscan.
> Fuad-Luke, A. (2020, in press).Indisciplinary world re-making.Artifacts as exploration, inquiry, disturbance, re-orientation and action. In A. Fuad-Luke,F. Piazza, L. Zellner, K. Krois, A. Mattozzi (Eds.). Traversing Territories. 1460 days of eco-social designing in South Tyrol and beyond…;Bolzano: Faculty of Design and Art, Free University of Bozen-Bolzano.
> Hancock T. &Bezold C. (1994). Possible futures, preferable futures, Healthcare Forum Journal, 23-29
> Haraway, D. (1988). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective, Feminist Studies, 14(3), 575-599.
> Hroch, P. (2015). Sustainable design activism: Affirmative Politics and Fruitful Futures. In B. Marenko& J. Brasset (Eds.), Deleuze and Design(pp. 219-248), Edinburgh: Edinburgh University Press.
> Illich, I. (1973). Tools for Conviviality, New York: Harper & Row
> Irwin, T., Kossoff G., Tonkinwise, T. (2015). Transition DesignProvocation, Design Philosophy Papers, 13(1), Routledge, 3-11
> Martin, B. &Hanington, B. (2012). Universal Methods of Design. Beverly, MA: rockport Publishers, pp.126-127.
> Manzini, E. (2013). Making Things Happen: Social Innovation and Design, Design Issues, 30(1), The MIT Press, 57-66

> Manzini, E. (2015). Design, When Everybody Designs: An Introduction to Design for Social Innovation, Cambridge: The MIT Press
> Margolin, V. & Margolin, S. (2002). A 'Social Model' of Design: Issues of Practice and Research. Design Issues,18(4), The MIT Press, 24–30.
> Papanek, V. (1972).Design for the Real World – Human Ecology and Social Change, Toronto/New York/London: Bantam Books
> Polanyi, M. (1958). Personal Knowledge: Towards a Post-Critical Philosophy, London: Routledge & Kegan Paul Ltd.
> Rancière, J. (2000). The Politics of Aesthetics: The Distribution of the Sensible, Continuum International Publishing Group
> Schubert, J. &Ugur-Yavuz S. (2020, in press) Designing Cross-Scalable Infrastructures, Paper presented at Sense & Sensibility conference "Lost in (G)Localisation". Lisbon, 2019
> Schubert, J. (2020, in press), Materializing Transformation – Tangibility as a designer's unique resource for tackling complexities. In A. Fuad-Luke,F. Piazza, L. Zellner, K. Krois, A. Mattozzi (Eds.). Traversing Territories. 1460 days of eco-social designing in South Tyrol and beyond…;Bolzano: Faculty of Design and Art, Free University of Bozen-Bolzano.
> Star, Susan L., &Griesemer, J. R. (1989). Institutional Ecology, "Translations" and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39, Social Studies of Science,19(3). Sage Social Science Collections, 387-420
> Ugur Yavuz S., Bonetti R., Cohen N. (2017). Designing the Next Smart Objects together with Children, Paper presented at the 12th European Academy of Design Conference "Design for Next". Sapienza University of Rome, 12-14 april 2017. In L. Di Lucchio, L.Imbesi, P. Atkinson (ed.),The Design Journal, 3789-3800.
> Wakkary, R., Odom, W., Hauser, S., Hertz, G., Lin, H. (2015). Material Speculation: Actual Artifacts for Critical Inquiry, Paper presented at the 5th Decennial Aarhus Conference on Critical Alternatives,17-21 august 2015, Aarhus: Aarhus University & ACM
> Wilde, D., Vallgårda A., Tomico, O. (2017). Embodied Design Ideation Methods: analysing the power of estrangement, Paper presented at CHI 2017, 06-11may 2017, Denver, USA: ACM

Make

A Designer sui Generis

We entered what can be defined as a "hybrid age", argue Ayesha and Parag Khanna (Khanna, 2013). A moment in which interpersonal relationships, sudden advances in the technological field, the transdisciplinary and performative nature of the socio/cultural context, no longer allow a simple co-habitation with the change, but rather presuppose, with increasing urgency, a real co-evolution.

For this reason, is, and always will be less possible, to be designers, or simply human beings, without considering how each element can influence the others, be influenced by them and relate.

This complex socio-technical scenario, therefore, requires the designer in particular, and training in the field of design in general, the ability to continually renew their offer, their methods, their tools. His critical sense in managing change.

This contribution investigates and qualifies the role of project education, as a subtle balance between opportunities for metabolism and slow reflection, highly experiential and transdisciplinary activities and digital tools beyond the traditional concept of space-time. It presents and systematizes a possible training strategy useful for overcoming the traditional self-referential dimension of the designer, to promote new attitudes, methods, models and approaches aimed at complexity. A model based on the contamination of different knowledge, as open as it is inclusive. The first step towards a more conscious planning.

[training, contamination, exploration, complexity, design]

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In its assumptions, the discipline of design has always been strongly influenced by dynamic changes in the reference context, by the wide range of material culture, by the relationship between economic, social, cultural and political conditions, by the manifestations of human action in a specific historical period. A context that Bauman well defines as a "liquid society", a society marked by the "belief that change is the only permanent thing and that uncertainty is the only certainty", a society where what matters is the speed of information and not their duration (Bauman, 2002). An extemporaneous society the contemporary one, a society in which every daily gesture is instantly connected to the global sphere through digital tools capable of offering instant answers to the multiple human needs, born as the result of a world to be continually rewritten, which feeds on "running" (Bauman, 2009), of "collective knowledge" (Lévi, 1996) and "connective" (Buffardi & De Kerkehove, 2011).

Teachers, as well as learners, are today the protagonists of an evident and silent revolution that has completely changed the relationship with knowledge. With training. We live in a complex and interconnected global system. "The more complex an organism is, the more capable it becomes; and the more capable it is, the more it can face challenges and seize opportunities. The downside of all this is that the more complex the organism becomes, the more vulnerable it becomes. "This is what the artist Adam Wolpert affirms, arguing that the most significant challenge for designers is, and increasingly will be, to manage complexity, inviting them to extend design thinking to a larger whole, incorporating different thought, a systemic thinking.

Never as in the contemporary historical/cultural scenario, the discipline of design is faced with continuous reflections on probable, plausible, possible or preferable future scenarios, on realistic as well as utopian new dimensions, on approaches that could strengthen its meaning as much as weaken its essence.

A design, whose purposes will necessarily demand with ever greater urgency a re-organization and re-structuring of the academy in general but specifically a rethinking of models and about training offer. A design, whose asking for an approach more focused on the present and on what we can specify as a "student experience", along the entire value chain, defining, as A. Bassi states in his book Design Contemporaneo, design as "a shared and plural process, the result of a work carried out in collaboration with different interlocutors" (Bassi, 2017).

In a moment in which the society is in continuous transformation, intrinsically performative and natively transdisciplinary, how can Design Schools always renew their skills, guaranteeing critical skills and systemic vision of a project inextricably linked to the territory and the reference context? And yet, despite the modern enterprise presents an organizational form that still tends to be conservative and multidimensional, represented by a plurality of actors with opposing interests and individual positions to defend, how can the formation of the design field act as a driving force towards a project increasingly connected and ingrained in the entrepreneurial culture?

Between news and concrete experiences, this contribution aims to reflect on the theme by presenting a multiform training offer model, as varied as it is changing. A

model based on open and inclusive contamination, as the first step towards a more conscious planning.

Last but not least, the contribution considers and thinks about the implications of the contemporary and disruptive health emergency in the field of training. Implications that have brought out, on the one hand, hidden vulnerabilities of a latent inadequacy for contemporaneity, on the other hand, unprecedented potential of distant, widespread, connected teaching. Consequences that have become mandatory today.

A complexity-oriented training strategy
The collaboration between heterogeneous realities for vision, strategy and objectives, the shared experiential participation, the contamination between different backgrounds, the unprecedented fusion of knowledge, the acquisition of a critical attitude able to go beyond the project in the strict sense, openness to confrontation, are some of the paths to be taken to, as Paolo Deganello states, give meaning to design and the training of the designer in the 21st century (Deganello, 2019).

In this scenario, placing relationships at the centre of the design process is an experience that arises from the need to recover and enhance the ability for imagination, but above all the collective skills that industrialization has ignored for a long time. In fact, before becoming a technical issue, innovation is a process-based above all on empathic and immaterial relationships between the subjects who participate in the achievement of a specific goal; this is a lifestyle that first of all involves behaviour and contamination between people.

A "social culture of the product" (Chiapponi, 1999), a social culture of the project understood no longer in exclusively technocratic terms as it can recognize a systemic, multidisciplinary interpolation. A collective work of social responsibility, a work that must necessarily start thinking in terms of complex systems.

Between occasions of concrete and experiential applicability, and moments of long-term metabolization, a reflection on models and strategies for a didactics of complexity is proposed below. Models and strategies that, with increasing urgency, find themselves having to be resolved promptly in the present time, to guarantee continuous updating and radical change.

Moments of reflection and long-term metabolism
Learning, according to the definition proposed by psychologist Ernest Hilgard, is an "intellectual process through which the individual acquires knowledge about the world which he then uses to structure and guide his behaviour in a lasting way". Thus, the knowledge acquired modify behaviour on the one hand in a physical way, on the other hand on a psychological and aptitude level.

Between teaching requirements, research qualification and flexibility of the training offer, structuring and defining a new course of study is a very complex thing.

In Italy, only at the end of the eighties a more fervent debate on the formation of the designer ignite (Riccini, 2013). A debate that, however, in a self-evident way has highlighted, and still highlights, incredible similarities in the training offer proposed by the different institutions, be they Universities, ISIA or Academies. An offer that still prefers a traditionalist conception of research in the field of design in general and the figure of the designer in particular (Furlanis, 2016).

In 1970, Thomas Maldonado in "The design hope" reflects on the relationship between design and change; a change still too often used as a pretext to slow down and postpone practical actions and interventions in a future perspective of environmental, economic and/or social sustainability.

Starting from what we can define moments of reflection, maturation and long-term metabolization, in the context in question limited to the fundamental role of the Design Study Programs, the reasoning in this sense and in the scenario described above, lead to the need for a total or partial rethinking in favour of a typological innovation in the field of education, aimed at contemporaneity. An innovation that provides an integrated and systemic vision of phenomena that are not only educational but also socio-cultural future ones.

Specifically, the reflection investigates a precise model of training offer for the three-year degree in design, dynamic in its offer and fluid in its form, which nevertheless preserves and qualifies a specific historical background and a precise methodological structure: the new Course of Studies in Design and Communication of the Polytechnic of Turin.

On the one hand, the proposal to bring forward the preparatory and "mandatory" preparatory teaching to the first year of a Bachelor's Degree leaves the room, in the following years, for the exploration and discovery of new frontier issues. At the same time, abandoning the mechanistic model, defined and closed in favour of an organic, dynamic approach, and "open-ended" to the inputs of the external context, local as global, will allow students to build their personal path, developing a sense of critical responsibility for their future work.

In this sense, complexity must be addressed by explicitly treasuring a shared approach between multiple actors, a collaborative approach because of its multidisciplinarity. A necessary re-territorialization that avoids any imposition by the productive world, to embrace its suggestions and charm.

Whether or not the business world is ready to welcome a figure much closer to the so-called freelance than to the traditional designer is still an open question. In this sense, the traditional internship at the end of the course certainly facilitates the approach, becoming a real testbed. But above all, what the presented model proposes is the opportunity for students to place themselves in the different sectors and aspects that characterize the life of a company.

Occasions of concrete, fast, experiential applicability
Experiential learning, as defined by John Dewey and Jean Piaget and subsequently deepened thanks to the contribution of the theorist David A. Kolb, is a process in which knowledge is created through the transformation of experience (Dewey, 1967). In an experiential learning context, one can therefore find oneself visiting places,

experimenting in the laboratory, reflecting on his own experiences, telling and sharing them. From this perspective, learning is, above all, a social process useful for facilitating the transfer of learned behaviours into future life and work situations. Laboratories, challenges, even workshops or summer schools. Over time, many labels are representing the broader concept of the laboratory as a moment of extemporaneous experiential learning. Moments to guarantee an increasingly less hierarchical but horizontal communication, of a model that is less and less mechanical as it is flexible, moments in which different actors and elements interact with each other. A full-fledged circular model on the basis of which each element conditions the other and is itself conditioned: in other words, a model in which the true meaning of each component must no longer be sought in the element itself, as in the system of relationships in which it is inserted (Bistagnino, 2009). Furthermore, a model in which the freedom and creativity of the individual are no longer realized in acting against each other, but in acting together with each other. With each other, encouraging collaboration and cooperation.

In response to an evident contextual complexity, and of which much has already been said, acquires greater strength the awareness that a long-term oriented training and slow thinking must necessarily be accompanied, within the Courses of Studies or outside with complementary activities, opportunities for immediate and concrete applicability. A dynamic and fluid training also, and above all, in terms of content. Training officially released from the strict dictates and regulations in favour of exploration more oriented towards experimentation. We are thus talking about workshops, present in the most different moments of the academic year and characterized by always new formats, or the Contamination Labs[1], experiential occasions in which elements for a new discursive dimension can emerge from operational practice (Riccini, 2017).

There is still a lot to say about the times, methods and spaces of this dimension. One thinks of the history of the PoliTo Design Workshops of the Polytechnic of Turin, the evolution of the Welcome Design Workshops of the Iuav University of Venice, the assumptions of DIDALABS, the laboratory system of the Department of Architecture of the University of Florence.

Furthermore, on an international level, the objectives of the Design for Development Workshops (D4D Workshops) promoted by the Massachusetts Institute of Technology, or the precise aims of the Kyoto Design Lab's Inclusive Design Challenge. However, focusing attention on the evident repercussions offered to teachers and learners by such training opportunities, the qualification of all those soft skills useful for the designer's work emerges; propensity to listen, overview, multi/transdisciplinary teamwork, to name a few (Peruccio, 2019). If, as Giuseppe Furlanis states, the design is essentially an interdisciplinary act, the interconnection with the territory and the workplace, with ever greater emphasis, must be a characterizing element, a driving force and a regenerative design action for the definition of the designer's training. To all intents and purposes a continuous research, a challenge to the complexity in determining and circumscribing the ever new boundaries of design.

If vice versa

All the skills and methods seem outdated, inadequate faced with the new and the unexpected. If the sudden changes in contemporary society have often made the training system obsolete, the impact of the pandemic on the university/education system has been disruptive, making a total redefinition of the training act itself very urgent. Moreover, it is precisely in this scenario that the concepts of space and time, of near and far, of urgent and extendable, of social and "asocial" have undergone a reformulation and redefinition of their most intrinsic and original meaning.

The dichotomies of remote teaching are many. Problems such as physical and mental fatigue, difficulties in group work, difficulty in interacting especially in the context of project activities, lack of real playful/social moments, not to mention sometimes inadequate spaces and malfunctioning connections have seen, for against, undisputed positive aspects: convenience and better time management, greater accessibility to materials of different nature, use and experimentation of tools useful for asynchronous communication and interaction, and much more.

What future lies ahead and what role remote teaching will assume is something difficult to predict today, especially in an area where the material, tactile/olfactory and experiential aspects have always been an integral part of knowing how to do. However, the real challenge will be to treasure the experiential/cultural heritage of this period and to think about which elements of the future education will be able to find in the remote digital system an effective and efficient tool for the personal enrichment of everyone.

Although the discipline of design is relatively young, it has always proposed itself as a critical and pro-active interpreter of the context, of the material culture of the present and industrial knowledge. An interpretation designed to provide the right degree of confidence in the ecosystem, even though the precise nature of the final object, in whatever form it will appear, will not be known at the beginning of the design process. The encouragement in favour of an atmosphere of openness and sharing is one of the missions that have always been inherent in the figure of the designer. A figure and knowledge strictly related to other knowledge.

"A discipline that would seem to consolidate around the sensitivity of not producing its autonomous knowledge [...] if anything, precisely by respecting the statutes and analytical knowledge synthesized by the other disciplines, it takes possession of it as a project input, as a basis for developing organized transformation actions" (Celaschi, 2008). A discipline that is fundamental today within the most diverse business contexts, because it is capable of diverting attention away from internal policies and tensions, bringing attention back to the real needs of consumers. That is a way to work constructively.

Cultural value and skills enhancement instrument, a tool for tracing new routes in innovation, a methodological tool for exploration, a tool for approaching complexity, a tool for reading social, territorial and productive changes (Germak, 2008). The

formation of the design field becomes a means through which to elaborate new visions of the world and new strategies for an "impromptu society" (Scalera, 2015), becoming connective, that is capable of producing innovative solutions thanks to the connection between people, objects, nature, technologies and production capacities.

In conclusion, the role of project education today, and with increasing emphasis in the future, must guarantee the overcoming of the purely self-referential dimension of the designer as well as that of a mere problem solver, to be the promoter of new methods, models and approaches aimed at complexity through the balance between moments of slow reflection, fast actions and digital tools beyond the traditional concept of space-time (Germak, 2016).
A design intended as a flexible and dynamic tool for interpreting the transformations of today's complex society. A chameleonic design capable of always defining new limits, boundaries and disciplines. A design sui generis, promoter of "indiscipline" (Iaconesi, 2016).

References

> Bassi, A. (2017). Design contemporaneo: istruzioni per l'uso. Bologna: Il mulino.
> Bauman, Z. (2002). Modernità liquida. Milano: Laterza.
> Bauman, Z. (2009). Vite di corsa: come salvarsi dalla tirannia dell'effimero. Bologna: Il mulino.
> Bistagnino, L. (2009). Design Sistemico: progettare la sostenibilità produttiva e ambientale. Bra: Slow Food.
> Buffardi A. & De Kerkehove D. (2011). Il sapere digitale. Pensiero ipertestuale e conoscenza connettiva. Napoli: Liguori.
> Celaschi, F. (2008) Il design come mediatore di saperi, in Germak, C. (a cura di), (2008). Uomo al centro del progetto: design per un nuovo umanesimo. Torino: Allemandi editore.
> Chiapponi, M. (1999). Cultura sociale del prodotto. Milano: Feltrinelli.
> Deganello, P. (2019). Design Politico. Il progetto critico, ecologico e rigenerativo per una scuola del design del XXI secolo. Milano: Altraeconomia.
> Dewey, J. (1967). Esperienza e educazione [Experience and Education]. Firenze: La Nuova Italia.
> Furlanis, G. (2016a). La didattica del design in Italia. Roma: Gangemini Editore.
> Furlanis, G. (2016b). La didattica del design in Italia, una premessa necessaria. In Furlanis, G. (a cura di), (2016). La didattica del design in Italia. Roma: Gangemini Editore.
> Germak, C. (a cura di) (2008). Uomo al centro del progetto: design per un nuovo umanesimo. Torino: Allemandi editore.
> Germak, C. (2016). Design. I paradigmi della ricerca universitaria in Italia. in Furlanis, G. (a cura di), (2016). La didattica del design in Italia. Roma: Gangemini Editore
> Hilgard, E. R., Bower, G. H. (1983). Le teorie dell'apprendimento. Milano: Franco Angeli.
> Iaconesi, S. (2016). Indisciplina metodologica. In Furlanis, G. (a cura di), (2016). La didattica del design in Italia. Roma: Gangemini Editore.
> Khanna, A., Khanna, P. (2013). L'età ibrida. Il potere della tecnologia nella competizione globale. Torino: Codice Edizioni.
> Lévi, P. (1996). L'intelligenza collettiva. Per un'antropologia del cyberspazio. Milano: Feltrinelli.
> Maldonado, T. (1970). La speranza progettuale: ambiente e società. Segrate: Einaudi.
> Pansera, A. (2015). La formazione del designer in Italia. Una storia lunga più di un secolo. Venezia: Marsilio Editore.
> Peruccio, P. P., Menzardi, P., Vrenna, M. (2019). Transdisciplinarity Knowledge: A Systemic Approach to Design Education. Proceedings of DRS LEARN DESIGN 2019 - Insider Knowledge: 5th International Conference for Design Education Researchers. 9 - 12 July 2019. METU. Ankara.
> Riccini, R. (2013). Culture per l'insegnamento del design. AIS/Design Storia e Ricerche, 1.
> Riccini, R. (2017). Siamo pronti al cambiamento? Il design e i dilemmi dell'educazione. In: Badalucco, L., Casarotto, L. (a cura di), (2017). Design e Formazione. Continuità e mutamenti nella didattica per il design. Padova: Il Poligrafo.
> Scalera, G. (2015). Il design nella società estemporanea. Trento: List.
> Tosi, F. (2020). La nuova normalità e la didattica aumentata dalla tecnologia. Il giornale dell'architettura. Disponibile in: https://inchieste.ilgiornaledellarchitettura. com/la-nuova-normalita-e-la-didattica-aumentata-dalla-tecnologia/?fbclid=IwAR2BCvQSgEmBJXtHCG2 xv2z_A87QF0PPheqIpFJp3Kz5nOOdEJc-myx8HJ4 [10 luglio 2020].
> Tosi, F. (a cura di) (2020). *Insegnare/orientare/fare DESIGN. L'offerta formativa univarsitaria italiana.* Milano: Franco Angeli.

[1] Contamination Lab (CLab) is a nationally-funded program that currently has 19 CLabs throughout Italy. Universities involved: University of Cagliari, University of Trento, University of Catania, University of Calabria, "Mediterranean" University of Reggio Calabria, Polytechnic University of Marche, University of Sassari, Polytechnic of Bari, University of Salento, University of Palermo, University "Ca 'Foscari" of Venice, University of Modena and Reggio Emilia University of Pisa, Polytechnic of Turin, University of Turin, University of Bergamo, University of Basilicata, "Parthenope" University of Naples, University of Teramo and University of Padua-Verona. Each of these realities is recognized at ministerial level by the Directorial Decree n. 315 of 29 November 2016.

The forms of education

"To give for granted, in a superficial way, the interchangeability between the two teaching methods - in person and remotely - means not having grasped the cultural and civil foundation of the school, proving to be oblivious to a tradition that has lasted for more than two millennia and a half and cannot be replaced by computer monitors or tablet distribution."

With this thought, the philosopher Massimo Cacciari emphasises a very topical issue: the diference between education and training.

The anomalous situation that has characterised the current year so far, has also strongly marked the world of school, forcing the mass adoption of digital tools for remote teaching.

The misfortune of this pandemic and the consequent lockdown, had the merit of emancipating the general public to the use of digital devices and questioning the established practices in the world of education and work.

In the field of design, the use of online training contents has been taking place for some time and in many forms.

A constantly growing trend, which sees the proliferation of training contents and users who are interested in learning paths tailored to their specific interests.

The designer, today, cannot ignore training moments through digital tools, in the form of tutorials and online courses.

However, individual learning and the educational contribution of a university education - which, not only consists of lectures and multiple choice tests, easily translatable into digital form - over opportunities for comparison between learners and teachers, not only in the classrooms but also and especially in the human and social relationships that take place outside these spaces.

University life is also made of these moments of informal knowledge and exchange, which represent a very important added value to the educational process. This contribution cannot be replaced by a digital surrogate, at least in this historical phase in which these tools are still being defined, as well as our relationship with them.

Manuel Scortichini

[education, training, learning, digital, remote teaching]

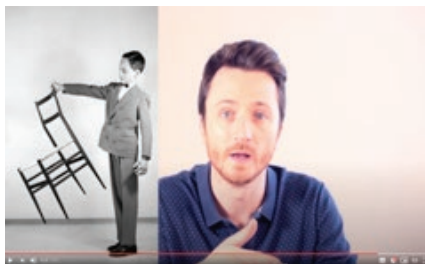Traditional and digital spaces: holographic personal computers.
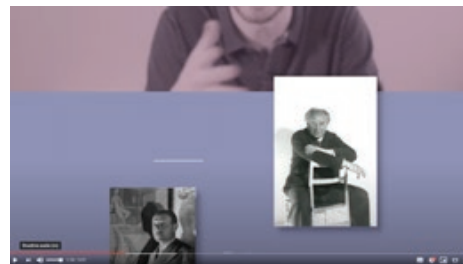
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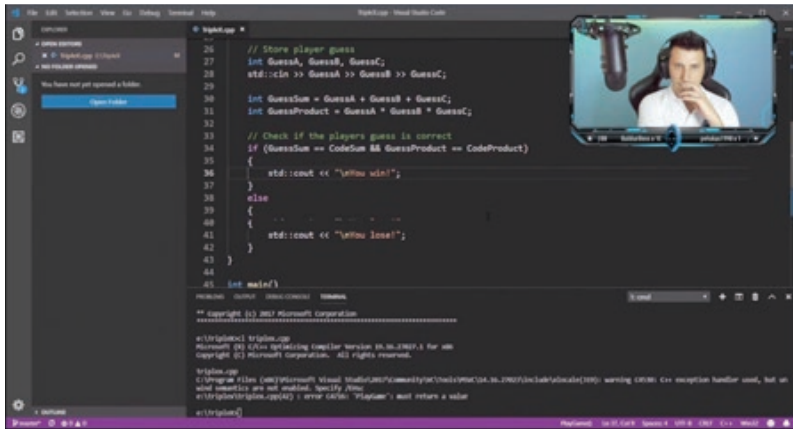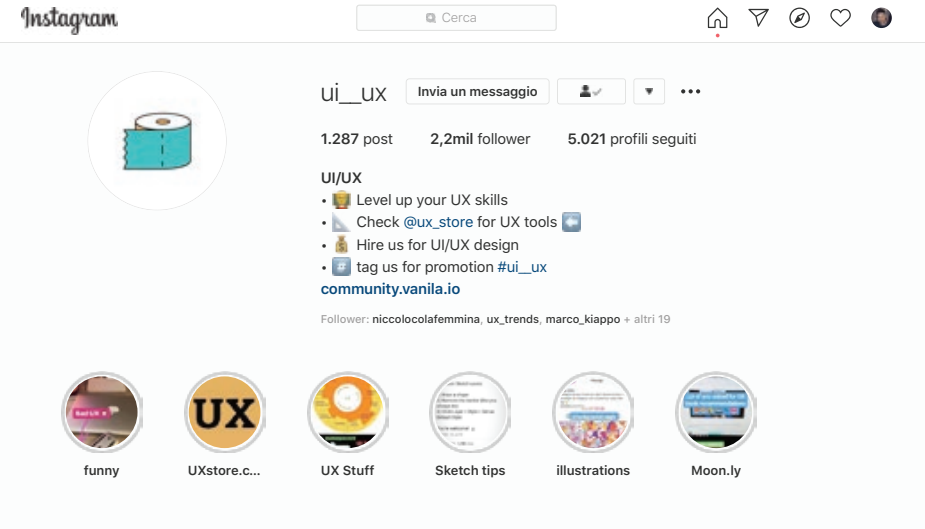
Social Network & Design
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The open and inclusive dynamic of social networks is renewing the creation and use of training content in the practice of industrial design. A kaleidoscopic world, of original content: from live marathons to video series, up to instant posts.
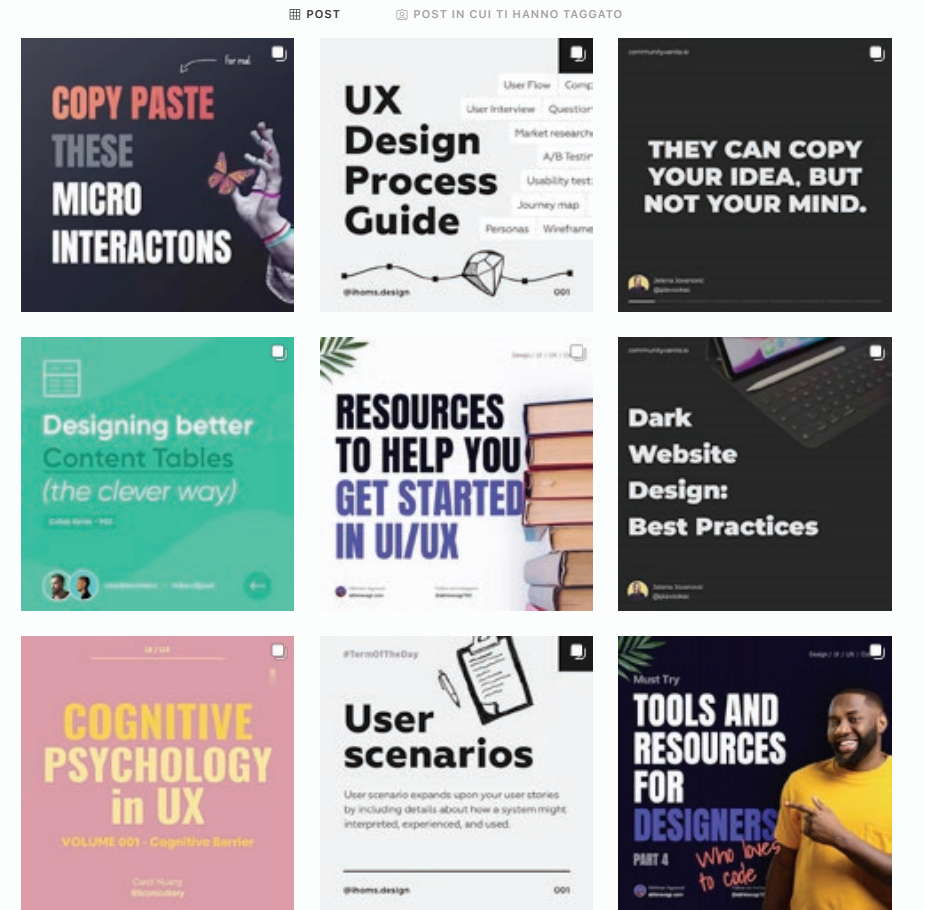

02

03

04

01 Live "*Learning Unreal and C ++ From Zero*". Twitch, GameDev, 2020.
02 Video "*Redesigning the AirPods PRO*". Youtube, Breccia, 2019
03 04 "*Gio Ponti Italian Design*" video. Youtube, Stefano Pasotti, 2020.
05 Instagram profile "*u___ux*". Instagram, Vanila.io, 2020.

05

The timing of training
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Industrial design is progressing, like medicine and engineering, to a greater fragmentation and specialisation of courses, in multiple disciplinary fields.
The training over increasingly responds to a demand for specialized courses of varying duration, intensity and frequency.

01

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01 Service design course. Four-day Masterclass, Royal College of Art, London, 2019.
02 How it works and how to use the most famous microcontroller ever. Two-hour workshop, Opendot, Milan, 2019.
03 Glassworks x ECAL at TRESOR Contemporary Craft. Four-day workshop, ECAL University, Lausanne, 2017.
04 Master Digital Exhibit. One-year international Master, IUAV, Venice, 2019.
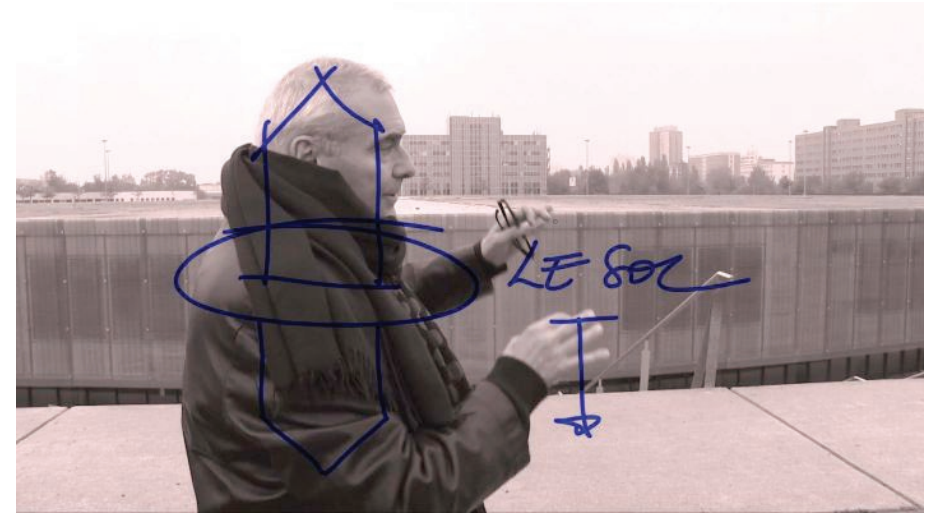
Homework # 89
Get a suit.
An old suit. Now, hijack it and transform it upon the desires of your best friend.
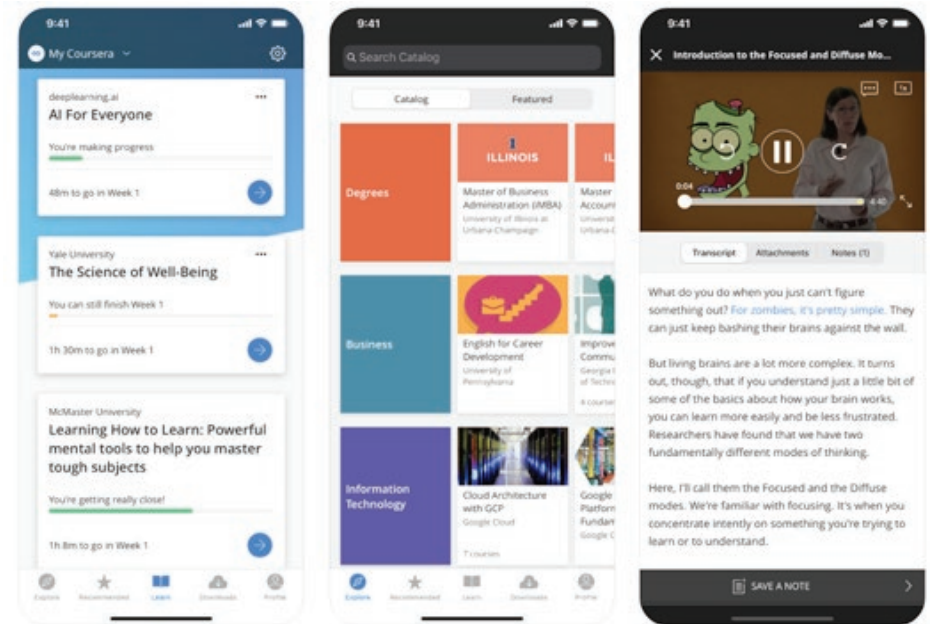

02

Massive Open Online Course
>
Millions of students from all over the world learn contents and topics with the same training processes, on platforms dedicated to MOOCs such as EdX or Coursera.
A dynamic of access to knowledge, where content fragmentation and gamification represent the new standards in the design of training courses.

03

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05

01 Design 101, Iversity platform, curated by Stefano Mirti, IdLab and Abadir Academy of Fine Arts of Catania, 2013.
02 An Open University student follows the lesson on TV. Open University, London, 1971.
03 Video Why should we design (more)? lecture. edX, Product Design: The Delft Design Approach, TU Delft, 2020.
04 Groundscape Architecture Design Lab, Dominique Perrault, ECAL, Lausanne, 2019 05 Coursera App Screenshot. Coursera, Apple App store, 2020.

Training as Performance
>
Summer schools, as places of autonomous experimentation, where training moments are intertwined with experiential activities.
Students from diferent and distant contexts confront and contaminate each other culturally, on common challenges.

01

03

02

04

01 Wings workshop. IAAC, Barcelona, 2014.
02 MADE Labs workshop. Formafantasma and Moncada Rangel, Syracuse, 2017.
03 Geo Synchronicity workshop. Open Design School, Matera, 2019.
04 Possibility of an Island. AA Visiting School, Chianti, 2020.

Focus

Building the Space of Knowledge

The very particular and difficult moment we are experiencing requires designers and educators to rethink the national education system in light of a design culture that embraces and brings together a diversity of spaces, ideas and instruments.
Many of the reflections that I would like to expand upon in this text can be investigated through projects from the past. These projects share a capacity to read particular moments in history, moments in which innovative spaces of knowledge were built. The first project is a large-scale educational project: the Open University (1960). Through radio and television broadcasts that aired between 1975 and 1982, the Open University outlined the portrait of an era, a method of teaching that seems very current again today. This school did not want to replace traditional systems, but rather integrate them with media.
The other projects, by the architect Cedric Price, are placed between architecture and design: Atom (1966) and Oxford Street Corner House (1969). For Price, the continuous need for new spaces for education required a very particular design capacity. An architect should recognize the possibility of spaces and objects before giving them a final shape. The project should not be restricted to the classrooms or libraries, but should identify and reconsider the many different places in the city in which one may learn: homes, cars, means of transport, factories, and supermarkets. Learning to recognize the spaces is the designer's first task.
We should understand, as the British architect did, that an educational structure is a social service and the design its natural evolution. In light of these considerations, the project culture should be built using an idea of architecture that standardizes different resources, ranging from the design of the communication terminal to the creation of places for learning: an integrated system of objects and spaces.

[educating, learning, designing, experimenting, informing]

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Today, educators are faced with a very particular situation: speaking alone in front of a screen, overwhelmed by different platforms that allow them to enable students to access the national education system. They try to adapt their teaching methods to a technique that only seems equivalent to the way they were used to teaching. The space of relationships, essential in any type of teaching, is compressed into a reflected image. The greatest risk is that the health crisis may be used to accelerate a process of transformation that hides other intentions and economic reasoning. 'A fierce cut to public financing, increase in student taxes, a drop in state funds for the right to study and offer of unsecured loans tied to merit, growing intervention of private institutions in policies of education and research…[1] This process has already affected all areas of public life and has changed the meaning of what we call 'common good'; it is enough to look at what has happened with health or justice. The community has been replaced with individual solitude.
This does not mean fighting technological evolution and all that it entails. Instead, it is necessary to integrate it into a project that should redesign the space of knowledge. Giorgio Agamben raises an allarm that can only be partially accepted. He twarns us about the risk of submitting ourselves for other reasons to the digital trend of remote teaching, which can never evolve into a system that could replace the space of knowledge as we have known it up to now.
'What for an attentive observer was evident — that is, the so-called pandemic would be used as a pretext for the increasingly pervasive spread of digital technologies — has been realized … Universities were created in Europe by student associations … Student life was above all a form of living in which study and listening to lectures was certainly a key factor, but no less important was meeting and constant exchange with other *scholarii*, who often hailed from very remote places and came together according to the original *nationes*. This form of life has evolved in various ways over the centuries, but from the wandering clerics of the Middle Ages to the student movements of the twentieth century, the social dimension of the phenomenon was a constant. (2)' Agamben's warning hides the fear that each one of us has that the crisis and need for social distancing may interrupt what has endured for nearly ten centuries. This is why it is necessary to rethink the space of knowledge through the project culture, to allow cities that host university campuses to keep those student communities that constitute the most lively part of the city in the streets.
In doing so, it is not necessary to deny the possibilities that the different remote teaching platforms offer; it will be necessary to integrate them in the new project.

It will be necessary to rethink the physical shape of the space, reorganizing communities, considering sthe temporary use of underused spaces in our cities, expanding forms of education to a broader audience, getting outside the schools.
First of all, we should understand the difference between *learning* and *educating*. These two terms are often used as synonymous, but if viewed from the perspective of the project culture, they present very different opportunities. Learning and educating

are the two most important aspects behind a school, which implies a place for learning in a broader sense, but also a space for producing cultural capital, which, rather than being consumed, should be the foundation for building a new community.

In every era, the need to learn has enabled different methods of education to shape the space of our schools and universities. The desire to spread knowledge has also turned new techniques of transmitting information into generators of large-scale educational projects.

Education is a fundamental factor in contemporary capitalism; the university in particular cannot be sustained as an independent public system and even in Italy, it is slowly tbending to the market logic. It is true that in Italy, university studies are public welfare at a low cost, but the system of conflicts with private interests may unexpectedly change as result of a remote teaching system.

In the 1960s, education was connected to the economy within welfare policies; the Bologna declaration (3) aimed to standardize university education by following the parameters of the neo-liberal economy. Privatization has changed the face of the university, introducing new conflicts in the international system and leading to gaps in learning opportunities. There are private universities that are very expensive and accessible through policies of control and bank financing, and public universities with few resources available. A further change is now expected on the horizon: some universities capable of building spaces and communities and others that focus on reducing management costs as new virtual platforms allow.

Many of the answers we are looking for can be found in past experiences. The projects I analyse below are projects that have represented fundamental moments of debate, which today, more than 50 years later, hold new, indisputable value. The first project is a large-scale educational project: the Open University from 1960. The other projects, by the architect Cedric Price, are found between architecture and design: Atom from 1966 and Oxford Street Corner House from 1969.

The Open University is tied to the concept of large-scale teaching. It is based on three educational trends after the Second World War. The first two were the desire to teach an adult public and the need to create an industry tied to the media, radio, and television. The third trend promoted the spread of education as a system capable of levelling class differences, that is, education for all.

To fulfil this purpose, the Open University systematized different media; education moved beyond the physical spaces of universities to reach a broader public, not trying to replace traditional systems, but rather integrating them. In the Open University, television, radio, postal services, study groups at local or regional centres, books, and newly designed spaces found the ideal place to be re-invented for teaching purposes (4). Teaching methods also changed radically: new figures entered the system and new economic and work possibilities appeared on the horizon.

The on-air university shared the space created by the media, becoming more accessible and expanding the audience, in which students and common spectators became the new users of the educational system.

Teaching occurred through lessons on TV, alternating with seminars, and testing of new forms of support and sharing of printed materials produced precisely for the courses. Architecture lessons fused spaces and buildings that had to be described, making use of media in ways that stretched their possibilities.

The Open University was founded on a matrix of tools and methods acting on different scales, building a new hybrid space of cultural production. The main goal of this experimentation was to educate students, but also to turn the passive TV viewer into a student who was active and therefore learning, It also extended the space of experimentation beyond the boundaries of traditional universities, invading other places in the city.

A distance learning courses were attended directly via phone, in-person seminars, and postal packages. The packages contained books, photographs, and kits designed as physical support for the studies. In addition to remote attendance, the Open University provided local study centres open in the evening during the week and sometimes even at weekends, where tutoring activities were held.

Only a small number of architects and critics in the New Left such as Reiner Banham, Stuart Hall, and Cedric Price had the capacity to rethink this project critically, understanding that it was necessary to create the base of society to reformulate this type of cultural experience, asking not only what to do, but also how to do it. In this attempt to reformulate the meaning of teaching, the contribution of Cedric Price is tied to a series of specific projects between architecture and design that followed open reflections with 'What About Learning?' an editorial published in Architectural Design in May 1968.

In his text, which is still could be very contemporary today, Price states that the educational system is managed by a few individuals that decide how and where one should learn. Children are educated to become adults, not educated children. Professionals and teachers are committed to educating people that already have the characteristics considered necessary by those same educators. Conceived thus, education becomes a codified system determined a priori; it is a marketing product to market, not a need. Price writes 'education is today little more than a method of distorting the individual's mental and behavioural life span to enable him to benefit from exiting social and economic patterning. Such an activity, benevolently controlled and directed by an elite can, in relation to the physical structuring that its system requires, do little more than improve on the range and network of structures it already has under its control. If the major concern is to increase the capacity of the individual to learn throughout life, then an entirely different attitude to the conditions (and buildings) under which such learning can best take is needed.'[5]

As a designer, Cedric Price believed in an idea of architecture not only tied to buildings as undifferentiated containers of functions, but also as a discipline capable of shaping human relationships; each functional programme should shape both the space and society. With his Potteries Thinkbelt, he showed that the space of education was not only a place for training but also a tool to manage and recover territory consumed

by industry. With the free space of his Fun Palace, entertainment became the reason itself for the cultural training of its users. With this belief that projected architecture beyond the profession, Price foretold that the act of learning would soon become the largest industry of each developed nation — which then effectively occurred — and that spaces dedicated to this function should be used and updated over time.

For Price, the continuous need for new spaces for education required a design capacity, but especially a capacity to recognize the possibility of spaces/ as objects and places that should not end at classrooms or libraries, but should be found in many different places of the city: in homes, cars, means of transport, factories, and supermarkets. Learning to recognize these spaces is the designer's first task.

The Atom project (6) is in many ways similar to the text published in Architectural Design, specifically with regard to an educational structure in a new city. The term *structure* is very important at this point in the discourse. In fact, the structure was capable of providing the basis for reinterpreting the idea of education itself, which did not refer to a category of predetermined space, but a constant necessity for all members of the community tas targets of the project.

The educational structure in Price's idea was a social service, the project its natural evolution. The project defines the terms of systematic instruction built through the architecture and design of communication terminals, which together defined the places for learning, an integrated system of objects and spaces.

Atom was not a project for a school as we imagine it, but a system designed to tie the physical space of the city to the system of information. Atom was meant to generate an environment where the borders between experiencing the city and learning would have dissolved completely. Atom seemed to anticipate contemporary forms of teaching focused on the services of platforms organized around the university; it anticipated the use of telephones and screens located in public places. It prefigured a world in which architecture and design merge with the space for living.

Price's first step was to classify the different informational terminals spread throughout the community and integrate them in planning, in order to use incidental media as educational terminals to induce new vitality in the community. Each device included in his list was potentially a tool to exchange and receive information. The aim of the project was to convert and reinvent the meaning of the simplest objects found in the city by basically implementing and adding complementary equipment. In this project, Price assembled a network capable of defining new conditions of learning. The network was composed of hubs different from Town Brains that guaranteed services for the educational structures, the rapid transit servicing and auto links tied to public transport systems and private cars through radio, TV screens, and maps. As with infant teach toys, home study stations — stations for learning located within homes — were essential in meeting the rapid evolution of the groups of users. Open-air servicing allowed for additional educational contributions from normal outdoor activities. Electronic audio-visual equipment and techniques, spaces and objects got smart.

In addition to the educational structures described up to now, he added physical spaces, called Life Conditioners, boxes and pavilions. The boxes contained structures for teaching and intensive learning. The pavilion was an experimental building enclosed in a temporary structure that housed offices and laboratories.

For Price, the educational structures were a social service and as such should overlap all areas of life. The best way was therefore to make them match with media where possible, with daily objects whose meaning had to be converted and updated, as was happening with the Open University. His intention in designing a community of this sort was not a utopian enterprise — or dystopian if you will — but rather the need to discover and organize ordinary relationships aimed at reinforcing the space of knowledge.

While Atom focused on the organization of a system of objects, the Oxford Street Corner House/Self-Pace Public School was a building to be realized in the centre of London where citizens would be able to find competencies, technologies, and information. A true prototype of a machine for teaching, mobile flooring, systems of projection, and walls becaming screens if needed on which organized information flowed in from a central brain.

'The architect was not content gto design hardware, but claimed increasingly broad responsibilities inherent in creating programmes for activities and determining the ways in which these were integrated' (7).

From the free space conceived by Cedric Price we reach the precarious space we find ourselves living in today, trying to reinvent teaching, not reasoning about a network of spaces and places as Price did, but de-localizing the community in a series of moments spent on platforms that only serve to reproduce real space with a strong sense of abstraction.

Today it is essential to understand that for the university, physical space for meeting is important, but classrooms and scientific communities should also amplify their features through virtual platforms and other spaces available within the city. This does not simply mean moving what was done before in class to a digital environment, but rather deeply rethinking the pedagogical approach, the organization of content, and strategies. This condition should be regulated through the project for a new space, a hybrid space in which new forms of physical and virtual interaction are cultivated. Now we will try to reason with the exact same planning ability that guided Price in his reasoning about the new media, to redefine the terms of remote teaching proposed by universities following the pandemic. The university has had to react to an emergency situation, looking to technology as the only viable path to enable lessons to be held regularly. But in doing so, it has forgotten the spaces in the city. The Internet and screens have replaced physical space, reducing the distances and creating a simulation of reality. The Open University and Atom, on the contrary, had the capacity to invent a new condition, transforming the idea of teaching itself without rejecting the quality of the space in which it occurs.

It is true that television relies on a screen and that the lessons were recorded, but the printed material created a space for interaction; distance learning was integrated with help centres where students could meet with tutors at certain times. The lessons were designed by a team of experts that made use of the potential of media and their characteristics. As with the diagrammatic architecture of Atom, he built the skeleton of the space later designed for the Oxford Street Corner House/Self-Pace Public school, where the individual architectural components were completely reworked.

I am convinced that, like with the past experience of television, we are approaching a two-pronged scenario. On the one hand, the system of remote university education is being reinforced by reinventing platforms that could become small physical places located at various points around the city, creating synergies among different schools. On the other hand, a system of public teaching — teaching that manages to shape common awareness — is being reinforced, leaving the university if necessary, which will be attended by students and also regular citizens. It will be necessary to build temporary spaces for sharing that work on a dual front — educating and teaching — drawing on the rich unused heritage in our cities and integrating strengths between different scholastic institutions. Mobility should be developed between teachers and cooperative programmes with foreign institutions to increase the local educational opportunities. The teaching of architecture and design in all its forms will require particular focus on the project, a project that is structural for transformations and the needs of a world that is evolving continuously. In this rewriting of the space, designers play a very important role, not because they should necessarily design new buildings and objects, but because through the project, they should situate architecture and design in an entirely new perspective. In this new attempt to construct the space, it will be essential to educate people about the project culture. The project culture is a process in which not only buildings and objects are produced, but also knowledge. It will be necessary to train a public and an entire managing class, because the project is constructed only based on a shared culture. There is no one method of education, but multiple actions that make it possible, from schools to information. Not only through museums and institutions, but especially through administrations.

With a precise style, Cedric Price defined palimpsests that interpreted economic and social changes, a type of project that he built with a narration about the city, educating about the use of new urban forms. We should start from this again, considering the project as an essential good for these transformations.

Education will require a commitment from designers and educators, who should reject the rhetoric of communication, museums, and institutions and rather initiate cultural practices in schools, and from administrations, who should find spaces to support schools. Only in this way and with constant dedication we will we be able to lay the foundation for a new space of knowledge that is capable of systematizing instruction, training, and information.

[1] Federico Bertoni, *Insegnare e vivere ai tempi del virus*, Nottetempo 2020.

[2] Giorgio Agamben, 'Requiem per gli studenti', Istituto Italiano per gli Studi Filosofici, 23 May 2020, https://www.iisf.it/index.php/attivita/pubblicazioni-e-archivi/diario-della-crisi/giorgio-agamben-requiem-per-gli-studenti.html.

[3] The Bologna process is an international process to reform systems of higher education in the European Union. It began in 1999 with the meeting of 29 European ministers of education held on 18–19 June of the same year in Bologna. An agreement known as the Bologna declaration was signed, which proposed creating the European Higher Education Area (EHEA) by 2010.

[4] Joaquim Moreno, *The university is now on air, broadcasting modern architecture*, CCA-Jap Sam Books, 2018.

[5] Cedric Price, 'What About Learning', *Architectural Design*, no. 5 May 1968.

[6] Re: Cedric Price, Hans Ulrich Obrist (ed.), *LetteraVentidue* 2011.

[7] Op cit., 6.

Students at the centre of the action

"Organising scientific seminars" is a course run by the author between 2004 and 2018 for the doctoral programmes of the Politecnico di Milano. The text describes this experience for the first time and chooses the teacher's perspective as a form of reflective practice. Further studies could include the contribution of the students so as to offer a broader description and to produce a comprehensive evaluation.

The text is divided into three parts. The first part analyses the context, content, and objectives of the teaching activity, in its first drafting, in which the action-based approach is identified and the lead is still in the hands of the teacher. The second focuses on the qualifying stage of the experience with the adoption of a learner-centred approach. This new drafting redesigns the dynamics of the collective interaction, motivations, and outcomes of the training process. The third part explores the pedagogical aspects highlighting the influence of the action learning approach of Reginald Revans – a way of learning based on peer-to-peer dialogue and on group work to solve concrete problems, in which the teacher acts as an observer or moderator of the class dynamics. Design studio pedagogy also comes into play. Given that many of the students are design graduates, this pedagogy provides them with a «habitus»: a common system of thoughts, behaviours and beliefs which have a major influence on the development of the action.

Finally, a provisional balance is sketched, underlining the change in the author's approach towards a teaching methodology that shifts the centre of learning from the expert's knowledge to the student's original contribution. This behaviour is based on being educated to listen and on the exercise of dialogic conversation – skills which are deemed central within the framework of the current debate on the updating of teaching models for design education.

[design education, doctoral training,
learner-centred approach, action learning]

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The course programme

In the early years of 2000, the doctorate of Industrial Design and Multimedia Communication at the Politecnico di Milano supported the forefront research of the academic community of Milanese design. At the same time, its pedagogic structure was fundamentally reviewed: «curricula were re-designed, advocating a progressive shift from searching in design to learning how to make research in design» (Pizzocaro, 2010, p. 94). It therefore seemed important to analyse the panorama of doctoral scientific output in this new asset.

It consisted of combining a number of objectives within a single project: on the one hand, mapping the content of the research, presenting it to the faculty and stimulating discussion on the questions opened up by the new curricula; on the other hand, offering PhD students new opportunities for team building and knowledge sharing, thus creating a fertile terrain for further study. Lastly, it was a case of implementing new training experiences, qualitatively different from lecture-style instruction. The author and the Doctoral Coordinator, Ezio Manzini, considered that an activity aimed at "Organising scientific seminars" could achieve these goals. Hence the establishment of the course with the same title in 2004.

Learning to run a scientific seminar is an objective in itself, given that this task is now routine for all researchers. Nevertheless, the course presented innovative elements for it was clearly focused on practice. Theoretical reflection, which also organised the content of the theses, was brought into the action, into the process of actually running the seminar.

From the very first, the PhD students were given a central role. Through their thesis work, they provided the seminar content and were both organisers and speakers. The invited experts would comment on the speeches and the department members would stimulate the debate from the audience seats. Thus, a sort of "flipped" relationship was established between the PhD students and the teacher, although it differed from the definition of Eric Mazur (1997), since in our case, the content of the discussion was also provided by the learners.

Despite the clear premises, in the early years (2004-2007), a teacher-centred approach was adopted to test the efficacy of the model. With the aims, modes and implementation times established, the students were asked to draft a summary of the thesis, describing the research question(s), the methodologies and the tools adopted, the main theoretical and/or operational issues addressed. In agreement with the Coordinator, it fell to the teacher to examine the material and to assemble it for key concepts that could stimulate seminar debate. The topics were then discussed with the class and adapted on the bases of the students' observations.

During this period, four major topics were analysed: "mapping", a tool every researcher should have full command of; "innovation" and "interaction", buzzwords of design culture, that require continuous and careful scrutiny; and finally, "territory", a word which suggested promising directions for the department research in the field of both design for cultural heritage (Trocchianesi, Borsotti & Mazzanti, 2016) and strategic

design (Parente & Sedini, 2017).

A third-year postgraduate was placed in charge of organising the seminar. S/He coordinated the team of speakers, gathered in and checked the speeches and verified the availability of the guest experts. A smaller group, made up of graphic designers, looked after communication and logistics. Lastly, the seminars took place during several evenings, in a lecture room of the department, in front of a small audience of faculty members and first-year PhD students. The events ended with a lively discussion.

The centre of the action from the teacher to the learners

For the purposes of this paper, 2007 was a turning year. On the one hand, the PhD students claimed a greater involvement in the choice of the seminar topics which constituted the centre of the activity. On the other hand, the analysis and clustering of the material, which was entrusted only to the teacher, turned out to be a very demanding task.

The author therefore decided to take a step back and look again at his role in the light of the premises and objectives. In other words, it was a case of intervening «in calculated and meaningful ways to alter the direction of learning to attain various shared, specific, and challenging goals» (Hattie, 2009, p. 22). This decision led to the adoption of a "person-centred" teaching model (Roger, 1969) – in our case, centred on the PhD student – which was meant to be a collective effort. In the following years (2007-2014), this approach redesigned the dynamics of the course and the teacher-learners interplay, achieving unexpected results.

At the start of the course and at each following stage, a peer-to-peer relationship was established which contributed decisively to the creation of a dynamic and collaborative atmosphere (Goodsell et al., 1992). In this climate, everyone felt free to make a contribution in terms of their own skills. In brief, PhD students working on service design suggested the use of new clustering methods for identifying the seminar topics; communication design students set up a blog for the exchange of ideas and documents and a website for disseminating information; strategic design ones pinpointed the responsibilities and drafted the job description; interior designers re-arranged the room settings to encourage conversation and team working. Roles and proposals could be varied according to the seminar programme, thus making it more flexible and suitable for everyone's contribution. Each assignment assumed equal importance and required the maximum commitment. The text of a press release or the choice of a poster colour pattern were as essential as the organisation of the catering service. In this sense, the operational dimension of the course assumed the character of a collective action.

The most significant change, however, concerned the role of the teacher. Initially guide, then moderator, lastly spectator. The challenge consisted in assuming the correct position within the group dynamics, not an easy task. It required concentration on understanding through discussion – that is, encouraging conversation, the pedagogic value of which, in these contexts, is recognised (Snaith, 2001; Baker, Jensen

& Kolb, 2005). On the other hand, as equality between speakers is a fundamental prerequisite for «real conversation» (Zeldin, 1998, p. 39), the presence of the teacher could inhibit the discussion. It required limitation to just a few tasks: presenting the arguments in discussion or summarising and commenting on the results, intervening only upon request. When it was felt that a problem that was key to the discussion was emerging, it could be useful to leave the classroom. Continuous attention was required. It is no coincidence that Richard Sennett analysing the dialogic conversation in collaborative practices (Sennett, 2011, pp. 18-24) finds constant references to the notion of empathy (Devecchi & Guerrini, 2019). This consultative role has therefore become the characteristic trait of the teacher. Only rarely was it abandoned in favour of active participation: to suggest alternative topics for the seminar of to solve unproductive discussion between the students.

In parallel to the teaching approach, the goals of the course changed. Instead of encapsulating the students' output in specific thematic areas, the examination of the theses moved onto searching elements that could build bridges, find connections, establish networks between the different works. This task requires analytical thinking, exercising the imagination and mediation skills, coaching students to build knowledge collectively. As a result, the initial aim of probing the efficacy of the doctoral programme has given way to more open investigations, and the seminars have become a means of exploring key issues arising from collective discussion or from coeval disciplinary debate.

A list of the topics covered can show the direction the seminars have taken: why has the dialogue, between actors and/or disciplines, become important in the design process? (2008); what is the purpose of design research at a time of crisis? (2009); does design research deal with politics? (2014); what is the meaning of evidence in design research? (2015); is it important to draw disciplinary boundaries? (2016).

Addressing questions such as these, in a seminar with PhD students, can appear hazardous. Nevertheless, the burden of the task has motivated the students and stimulated debate. In other words, it provided the group with suitable psychological fuel for achieving their objectives. With regard to the final results – as we shall see later – these were evaluated more from a pedagogic than scientific perspective.

Pedagogic models

On the pedagogic level, "Organising scientific seminars" could be considered an adaptation of the action learning approach of Reginald Revans (1972; 1982; 2011). Originally developed for businesses as a method of management training, «action learning describes an educational strategy, used in a group setting, that seeks to generate learning from human interaction arising from engagement in the solution of real-time (not simulated) work problems» (Raelin, 2000, p. 66). The affinity with the course – already clear in the definition – is specified in the comparison with the key principles set out by Revans (Pedler, Burgoyne & Brook, 2005, pp. 58-59) (in *italics* those adopted in the doctorate):

. Action underpins learning / *The task is how to organise a seminar, both theoretically*

and practically.
- Personal development comes from a reflection upon action/ *The learning process stimulates both individual and collective reflection at every stage.*
- Concrete problems are addressed / *The seminar is the de facto outcome of the learning process.*
- Problems are aimed at the development of the individual and of the organisation / *The discussion centres on key questions for both research practice and disciplinary development.*
- Action learners work in peer groups to support and challenge each other / *Learning comes from peer dialogue, the students work as a class or in groups according to the objectives.*
- A higher priority is given to the search of new proposals as opposed to the established knowledge of experts / *New perspectives on what to discuss and how to discuss are strongly encouraged.*

It is noteworthy that action learning is accrued in a non-academic environment. In fact, it «has been controversial, especially because of its championing of the ideas of practitioners or action learners over those of experts and teachers» (Pedler, Burgoyne & Brook, 2005, p. 49). By adopting this approach, a principle uncommon in academic practice is introduced, namely that the students themselves are recognised as experts, able to bring into the conversation their own contribution of ideas, maturity, and skills. The professor assumes the role of «coach», or «accoucheur» (Revans, 2011, p. 101), able, sometimes, to «fade away». When the teacher releases control, the students radically change their way of thinking and behaving. Conducting the seminar is the equivalent of putting themselves to the test. It stimulates involvement and commitment. During the interaction, the students are considered to be colleagues working together. Everyone has the right to contribute to the discussions and to the decision-making process. In a multicultural context, such as that of the doctorate, this collaborative atmosphere assumes an even greater pedagogic value.

On the other hand, an academic seminar differs from a formal course, precisely because of the conversational nature of the teacher-learner interaction and because of the encouragement of the sharing of ideas. It is therefore interesting to compare the action learning approach with that traditionally used in university lecture rooms. The two learning activities share «their small-group characteristics and questioning as a means of learning», but differ in four fundamental aspects. In the seminars: a) the teacher is an expert in the subject matter and acts as leader; b) the discussion is focused on «a recognised intellectual discipline» and c) stimulates critical thinking; lastly d) the seminar does not necessarily lead to an action (Simpson & Bourner, 2007, pp. 179-180).

Revans' action learning, is rooted in the pedagogy of experience (Dewey, 1916; 1938) and finds significant correspondences (Gray, 2001, p. 318; Beard & Wilson, 2013, p. 15, 26) both with the model of experiential learning (Kolb, 1984) and with the concept of reflective practice (Schön, 1987). Therefore, in all these pedagogic approaches, a sort of family resemblance is acknowledged, centred on the idea that the experience a student acquires by practically doing something is a fundamental part of the learning process. This description certainly also sounds familiar to design professors, as it replicates a habitual process in the design studio. Notwithstanding the substantial changes undergone over the course of the years (Boling et al., 2016), studio teaching remains the signature pedagogy of design education. The studio is the locus in which students «are instructed in critical aspects of the three fundamental dimensions of professional work – to *think,* to *carry out* and to *act with integrity* [italics in the text]» (Shulman, 2005). Given that the majority of the students of the course come from design schools, this pedagogy performs an essential role, providing the group (teacher and students) with a «habitus»: a system of thought, of shared behaviour and beliefs (Bourdieu, 2005, pp. 43-49). Furthermore, on a closer look, "Organising scientific seminars" represents a revised version of the design studio, aimed at handling an intellectual construct – the seminar – instead of a product. Similarly, we can consider the mapping of knowledge as content and the final seminar as form of the design process.

Different forms of academic discussion can be tested: "Designing for ... products, culture, cities, co-innovation" (2012) subdivides the discourse into parallel paths, as in many conferences; "Politically designed" (2014) and "Seeking evidence" (2015) discuss disciplinary questions; "Designing in a time of crisis" (2009) and "Navigating uncertainty, together" (2018) explore the conditions of the present day. A particular topic can be tackled from different perspectives with different interpretations being provided such as in the consecutive seminars "Politically designed" and "Seeking evidence". The first questions the neutrality of research (Latour, 1999). The second aims at developing an approach that avoids subjectivity and ideology (Cross, 2007; Friedman, 2014).

Given that, each year, the same process is applied to different material and with different actors, the final seminar becomes a prototype that responds to the changing specifications of the design brief. Like all prototypes, the seminar is fully functioning, although it may require further refinements. Therefore, its execution is equivalent to a test that verifies its efficacy through the feedback of invited experts and of the audience.

Stimulating dialogic conversation
"Organising scientific seminars" outlines a training process aimed at acquiring behavioural, intellectual, and practical skills. Many of these skills relate to the profile of a designer capable of working in collaborative and multicultural groups involved in the designing of actions. In this sense, the students experience and put into effect a process which replicates many of the conditions of contemporary design practice. The whole training activity outlined thus far is seen from the teacher's perspective. The students' appreciation is acknowledged in weak – and still subjective – signals such as the climate in the lecture room, the commitment, the consistency and productivity of discussion. Or again, what emerges from the collective and individual

conduct is: the general satisfaction with the seminar speakers, the lively dialogue with the experts, the subsequent comments. It is clear, however, that the response of the students requires further study to fully assess the effectiveness of the teaching model. What we can now acknowledge to this long experience is the educational value for the author as a teacher. This value lies in the acquisition of attitudes enhancing the student's skills and work, especially through dialogic conversation. Listening is as difficult as speaking. The attentive listener should recognise the other (the speaker) as peer and interact accordingly. This quality is fundamental if the centre of learning shifts from the expert's knowledge to the student's original contribution. There are always opportunities in dialogic conversation to highlight incongruities or weaknesses in a procedure and to suggest ways of improvement. What counts is to keep the student aware that s/he acts independently.

If PhD students are already mature learners and therefore ready to address this exercise, younger students can also carry it out – as the author has proved, in fact – when the teacher is prepared to deal with the challenges of listening and capable of translating them into a constructive dialogue. These skills are nowadays essential in design teaching.

References

> Baker, A.C., Jensen, P.J., & Kolb, D.A. (2005). Conversation as Experiential Learning. *Management learning, 36*(4), 411-427.
> Beard, C., & Wilson, J.P. (2013). *Experiential Learning: A Handbook for Education, Training and Coaching* (3rd ed.). London: Kogan Page.
> Boling, E., Schwier, R.A., Gray, C.M., Smith, K.M., & Campbell, K. (Eds.). (2016). *Studio Teaching in Higher Education*. New York: Routledge.
> Bourdieu, P. (2005). Habitus. In J. Hillier & E. Rooksby (Eds.), *Habitus: a sense of place* (pp. 43-49). London: Ashgate.
> Cross, N. (2007). *Designerly Ways of Knowing*. Basel: Birkhäuser.
> Devecchi, A., & Guerrini, L. (2019). Empathy for Resilience. In J. Häkkilä, M. Pakanen, E. Luiro, E. Mikkonen & S. Miettinen (Eds.), *Around the Campfire – Resilience and Intelligence. Cumulus Conference Proceedings* (pp. 594-607). Rovaniemi, Fl: University of Lapland.
> Dewey, J. (1916). *Democracy and Education*. New York: MacMillan.
> Dewey, J. (1938). *Experience and Education*. New York: Macmillan.
> Friedman, K. (2014). *Evidence-Based Practice in a Changing World Economy*. Retrieved from https://swinburne.academia.edu/KenFriedman.
> Gray, D. (2001). Work-based Learning, Action Learning and the Virtual Paradigm. *Journal of Further and Higher Education, 25*(3), 315-324.
> Goodsell, A.S., Maher, M.R., Tinto, V., Leigh Smith, B., & MacGregor, J.T. (Eds.). (1992). *Collaborative learning: a sourcebook for higher education*. University Park, PA: National Center on Postsecondary Teaching, Learning, and Assessment. Retrieved from https://eric.ed.gov/?id=ED357705
> Hattie, J. (2009). *Visible learning: a synthesis of over 800 meta-analyses relating to achievement*. London: Routledge.
> Kolb, D.A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice Hall.
> Latour, B. (1999). *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, MA: Harvard University Press.
> Mazur, E. (1997). *Peer Instruction: A User's Manual*. Upper Saddle River, NJ: Prentice Hall.

> Parente, M., & Sedini, C. (2017). Design for Territories as practice and theoretical field of study. *The Design Journal, 20*(sup. 1), S3047-S3058.
> Pedler, M., Burgoyne, J., & Brook, C. (2005). What has action learning learned to become? *Action Learning: Research and Practice, 2*(1), 49-68.
> Pizzocaro, S. (2010). The in-progress status of doctoral research in design. Reflections from two decades of local doctoral research. In L. Guerrini (Ed.), *Notes on Doctoral Research in Design* (pp. 91-101). Milan: FrancoAngeli.
> Raelin, J.A. (2000). *Work-based Learning: The new frontier of management development*. Upper Saddle River, NJ: Prentice Hall.
> Revans, R.W. (1972). Action learning: A management development program. *Personnel Review, 1*(4), 36-44.
> Revans, R.W. (1982). *The origin and growth of action learning*. Bromley, UK: Chartwell-Bratt.
> Revans, R.W. (2011). M. Pedler, (Ed.), *ABC of action learning*. Farnham, UK: Gower.
> Roger, C. (1969). *Freedom to Learn: A View of what Education Might Become*. Columbus OH: Charles E. Merrill Publishing Co.
> Schön, D.A. (1987). *Educating the Reflective practitioner: Toward a New Design for Teaching and Learning in the Professions*. San Francisco: Jossey-Bass.
> Sennett, R. (2012). *Together: The Rituals, Pleasures, and Politics of Cooperation*. London: Allan Lane/ Penguin Books.
> Shulman, L.S. (2005). Signature pedagogies in the professions. *Daedalus, 134*(3), 52-59.
> Simpson, P., & Bourner, T. (2007). What action learning is not in the twenty-first century. *Action Learning: Research and Practice, 4*(2), 173-187.
> Snaith, A. (2001). Conversations and seminars. In R. Stott, T. Young & C. Bryan (Eds.), *Speaking your Mind: Oral Presentation and Seminar Skills* (pp. 6-29). Harlow, UK: Pearson Education.
> Trocchianesi, R., Borsotti, M., & Mazzanti, A. (2016). Artistic placements: reading and interpreting artistic interventions in the landscape as a design approach for the development of the territory. *The International Journal of Architectonic, Spatial, and Environmental Design, 11*(2), 15-27.
> Zeldin, T. (1998). *Conversation: How Talk Can Change Our Lives*. London: Harvill Press.

Design Acculturation and Design Didactics

This paper is based on the investigation of specializing and professionalizing training experiences analyzed by the author, and a case study about the origin of a "connection" between acculturation, skills improvement and the evolution of the design profession.

The main topics covered by the discussion concern the expansion and growth of the design discipline on the one hand, and on the other hand the issue of tools and methods of a training that needs to keep up with the times and with the change of project technologies , but still following and supporting the same continuous extension of the limits of the discipline.

It is precisely the issue of the criticality and complexity of the limits that this paper intends to explain with a perspective that arises from the education users and is detected through their learning requests, their identification of the main topics for specialization and their ability to understand the relationship between the topics of a constantly evolving discipline and the professional skills to be acquired and proposed on the market of intellectual professions.

Each school, which generates an offer aimed at the implementation of skills and cultural depth, acts as a connector between limit knowledge and its application in a professional context in which designers are increasingly "integrators" and fewer individual authors. This position has been highlighting for some time the complexity of offering educational quality in the fluidity of the context and we can generally see today the diffusion of digital solution and for the digital, with some experimentation about distance learning. However, the learning-by-doing method remains widespread, although perhaps challenged by the substantial change in the project discipline. The pandemic has introduced constraints that have forced methods and approaches to design teaching, creating significant opportunities for experimentation, which we are going to discuss.

[design education, acculturation in design, multidisciplinary design, remote teaching, online learning]

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Theoretical reference framework

The context of design training in the last 20 years is characterized by a very fluid and complex reality, as Ezio Manzini described (2004): uncertainty about the disciplinary and professional boundaries of Design, but not only, is a direct consequence of such fluidity. It is the crisis of the "solid" world of the past, in which the "disciplinary boxes" were defined and recognizable and everyone could place him/herself in, feeling well defined in his/her own professional identity. Today, those boxes seem as open and, according to Manzini, everyone should redefine him/herself and his/her skills.

However, in a pragmatic and manufacturing discipline such as that of "planned" design, this fluidity may involve that such an autonomous definition finds support in a sort of mapping, an order or a new categorization of cultural areas and professional skills of Design that need definition through education praxis. The multiplication of references and an increase in available information generate a context complexity (Friedman 1997,2005) that is reflected in the definition of both the complementary skills of the designer and the fourth-generation design tools offered by the digital age. Designers are increasingly "integrators" of skills (Bertola, P.2004) (Acklin, C.2011) and find themselves facing fluidity and complexity at the same time.

However, the issue is whether the approach to training and the teaching method of today's design are coherent with this rate of fluidity and complexity, or if they shall be implemented first by assimilating the potential of enabling, generative and collaborative tools and then by implementing a method that involves the consolidation of multidisciplinary skills within the typical learning process of project teaching laboratories, based on interaction and negotiation.

The hypothesis that we intend to formulate is that the consolidated approach to the culture and practice of design can be deconstructed and recomposed in a formulation that is enriched by specific and punctual skills and by a multidisciplinary integration capacity implemented by the technologies of interaction and co- design even from a distance.

It is a double phenomenon that includes a "de-culture", an ethno-anthropology process that involves a sort of reset when a dominant culture arrives and an "acculturation" where new elements are acquired and elaborated both in the original and arising cultural contexts (Young Kim 1988, 2001). The theory of acculturation can be achieved in several forms: Kim sees in "assimilation" the highest degree of acculturation in the host environment where the deculturation of original cultural habits has occurred. Otherwise, a process of "integration" occurs where the original culture persists but there is a phenomenon of osmosis and collaboration with other groups (DL Sam, 2006): this is the previously described integration, which refutes the assumption of a single existing culture of the dominant project to be accepted in the contemporary world, fostering a vision of a plural and flexible approach, in which external skills and their influence on methods and processes determine how to formulate a specialized and informed project.

In other words, Design can maintain its methodological identity and measure itself and evolve in a "multiverse" context where, however, practices, and especially their

teaching, evolve compatibly with external inputs. In this context, it includes the IT and digital evolution which constitutes the downside of extending the limits of the discipline: the project practice. Teaching shall provide remote and multi-platform collaborative design skills, cooperative and generative tools: from cooperative and simultaneous parametric modeling to the definition of algorithms for variable fonts, and so on.

The case
In POLI.design (the postgraduate Design School System of Politecnico di Milano) less than 10% of the post graduate specialization education offer is attributable to consolidated and historical contents of the design discipline. More than 90% offers disciplinarily "integrated" content.

This 90% includes requests for dedicated design and teaching tools (software and tools) that produce a specialization of teaching timing, create a specific language and, in fact, a specialized culture.

Equally, however, the in-school didactic design studios refer to face-to-face training, rarely software based and structured on an iterative process of elaboration, often on several cycles, which is rarely integrated with grafting of specialized culture or tools for specific phases of the project. Therefore, for some time now, in the teaching practice of this post-graduate school, the request for integration between contemporary tools and multidisciplinarity on the one hand, and holistic and emulative-iterative project methodology on the other, is emerging strongly.

Today, the difficult and slow transition towards this integration has suffered the shock wave of the pandemic and its effects on the times, methods and tools of design teaching: it has forced many schools to practice education, introducing the distance between subjects, imposing the tolerable and efficient timing of streaming (extremely reduced and dense compared to time in presence), activating the assiduous use of media and software tools for graphic and conceptual interaction. These changes have produced positive reactions among the students and a request for the consolidation of the new methods and the expansion of the use of new tools so as to prepare for a further evolution that is not only an emergency or distancing solution, but an opportunity to speed up and increase contacts between disciplines and number of interactions / contributions of each design lab.

Didactics and disciplinary extension
In Jonathan Swift's ancient classification, design was initially forced into the "paleoteric", or the sphere of historical knowledge, consolidated and inactive in the evolution of the human condition. (Buchanan, 2001). After a century of evolution of modern design, its transition to an active and organized "neoteric" culture for an evolved vision of the world and its affirmation as a university discipline, perhaps today the paradox of a form of orthodoxy of design teaching is taking shape, putting again Design in a paleoteric and not consistent with the change vision.

In other words, the contents are advancing, and the limits of the discipline are extended, but the methods and practices of design do not follow and do not favor the skills of designers and the creation of an updated and professionally effective design culture. There is a tendency towards transversality as an intellectual approach which, however, might be arising with the evidence of a sort of "original sin": already in 1957, when designers and architects were one, Giò Ponti said that "an architect is qualified to do many things, there are no diversions, everything a man does is always on the same level in its expressive continuity and with the same laws", supporting and contributing to the affirmation of a transversal and general approach to the project that Italians masters have elevated to an element of success and affirmation of a style which is now part of the didactic structure in design schools. For about twenty years, however, the same design culture has taken different paths and has progressively broke free from the architectural one and, consequently, evolved towards its references that have largely exceeded the boundaries of expressive and constructive quality, reaching nanotechnologies, additive manufacturing, value chain, brand identity and strategy, experiences and digital interaction. A monolithic or individual approach with this level of complexity, in which the context of knowledge and practice constantly evolves and with respect to which acculturation could take place, rather than through an "integration", through a "segregation" of designers into phases limited conception of products and services, or worse, through a "marginalization" from the same process, is no longer conceivable (DL Sam, 2006). There have been discussions in the past on an approach to architecture detached from change, what Marco Romanelli (2019) described as the phenomenon of "architects without architecture" and today the teaching of design faces the challenge of building a new generation of "designer with a design".

The question of this Call, whether "a preparation that in the past was based on the interaction between art, design and architecture is still sufficient", is answered in a design culture in which multidisciplinarity and digital interaction are sufficiently "informed", constituting a communication network between different and converging knowledge in the design solution. The direction in which education at POLI.design is now going prepares for a fragmentation of the project in several steps, with augmented networking between skills and project actors, with more remote interaction in the development and comparison steps and consequently less presence and less iterative or emulative processes. Teaching the project thus appears predisposed to a more specialized vision of the contents offered, in which the introduction of specific contributions and heterogeneous and targeted skills at the service of the designed solution, their "integration" in the methodological backbone of learning by-doing and the verification of their "assimilation" in the student's competences, can be performed by project phases or blocks of content. Although the project has always been treated as a complex system of knowledge, impossible to divide into pieces, it is precisely the multidisciplinary courses and integrated laboratories that require this ability to distinguish the quality of the specific contributions of each discipline in the stream

of an educational path of synthesis. This direction of evolution of the teaching methodology appears even more valid if we confirm the effectiveness of team learning in order to create an ecosystem of different skills and roles to the advantage of the designed solution: in this case proceeding to refine the solution involves iteration and negotiation on a knowledge base less permeable to external contributions than an approach for in-depth analysis and collection of information, external to the initial knowledge, which stimulates not only vertical interactions with the teacher, but also transversal with teachers of related disciplines or companies / entities that contribute to the teaching process.

The definitions of design on the threshold of the contemporary era described it as a "process of creation, invention and definition separate from the production, which involves a possible synthesis of contributing factors" (J. Heskett, 1980) but today they are refuted by the fact that the tools of the project are themselves tools for the "production" of solutions and there is no evident continuity between the phases of conception, development and realization of products and services.

It is precisely digital and communication technologies that review the categories and phases in which the designer can act with a sense of integration and continuity of thought. They support a learning-by-doing process in which the learning of methods and tools run in parallel as an experience process of identifying solutions (Sim & Duffy 2000), (Wu & Duffy, 2003) which is proposed as an integration between the doing and knowledge aimed at solving that phenomenon that sees the rate of design creativity reducing when specific and technical awareness grow (model of evolution of design knowledge along the project, Kroll, Condoor & Jansoon, 2011).

Based on the above considerations, the model that is configured seems to have two value axes: the first is cultural depth and extension, the second "multidisciplinary" design capability.

Digital age and distance didactics
The reflection on the extension of the limits of the discipline and its implications for the effectiveness of the teaching process already contains the variables and potential of the digital age. However, due to the pandemic, in the first months of 2020 a particular situation that we could almost define an 'in vitro' test on a global scale showed how design can be taught (but above all to design) without activating interactive and iterative processes in presence.

We should also consider how important could be, especially for the Italians, not only to change teaching practices, but also to lose contact with the environment and the context of European design and its companies, design weeks and international participation that it creates a community of designers abroad capable of "physically living" design with such a cultural intensity that it constitutes in itself a formative moment. In the absence of all this, the discipline was only confronted with its foundations, its practices and the review of the efficiency of the teaching process. The sudden need for distance learning has highlighted the limit of transposing the real into the virtual:

streaming does not allow you to "copy" the activity in the presence and its interaction and environmental advantages. Human interaction, negotiation and emulation of the design act are effectively compensated with the use of virtual simulation and visualization technologies which in design are already useful for the visual synthesis of products and services. Information is shared and processed more easily through platforms, graphic tablets, dynamic and collaborative three-dimensional models and other tools, also facilitating delocalized and highly internationalized teaching, such as that of POLI.design, in which 43% of students are foreigners. A conversion is created in a project orientation process that also includes an offline development, made up of individual investigation and information then connected within the team online. Thus, favoring a greater division of roles and tasks in the project experience. The temporal continuity and sequentiality are then replaced by sporadic and punctual activities alternated by moments of integration.

When the limits of streaming become clear, the principles of e-learning are affirmed: the teaching processes are converted into blocks of content, for in-depth study and offline or live learning. It seems that a space is naturally created for those specialized and punctual contributions to the design process that were mentioned in relation to the complexity of the disciplinary extension. At the same time, the e-learning systems are integrated into LMS (Learning Management System) platforms hosted in the corporate sites of the schools in which that ecosystem of lost experience and community is potentially recreated: students and alumni belong to a virtualized community which they access through a digital identity to exchange content, follow lessons, access software and communicate.

And if we ask the question in terms of process efficiency, where its effectiveness is potentially comparable to traditional methods, we can note that in virtual processes many contents can be previously prepared and offered on several occasions and to different subjects, while times and agenda of the training process are more compact and dense to the advantage of in-depth study and individual study times.

By 2030, all schools engage in a verification of these methods and their effective ability to train new generation designers.

Conclusions
The qualitative case study of design teaching in schools precisely concerns the relationship between extension of the discipline and introduction of digital and distance learning.

Analyzing the applications for admission to the courses for the proposed qualifications / content and the evaluation forms of the didactic contents, there is a broad and multidisciplinary content offering policy aimed at "professionalization" with an application approach and with reference to topics that are frequent in the labor market and for professional activity.

However, since the business culture and corporate organizations they are not predisposed to quickly assimilate and exploit in their processes what is new in terms of

knowledge management or integration of skills, making extended and limited contents applicative does not in itself presume that the outgoing figures are "professionalizable" or not necessarily the alumnus sees the depth and breadth of his knowledge recognized. Furthermore, the business environment is often not prepared to face the risk of limits or to go beyond the perimeter of professional categories and organizational roles.

POLI.design bases its teaching on the relationship of collaboration with companies/ organizations involving them in a process of "acculturation" to multidisciplinarity. With the sudden phase of transition to distance learning, it was precisely the companies that highlighted the need to re-outline professional skills by combining multidisciplinarity with the ability to act on digital platforms, to collaborate, but also to participate in communities of people and of new generation knowledge that companies foresee for their future organizational systems.

Here, students and faculty have identified the need to build skills on remote collaboration tools but also to carry out career building actions in which the same new skills are highlighted and effectively declared at the time of placement.

It is about building a new generation professional culture based on the revision of the reference points of the design practice, consisting of hardware and software tools: classroom visualization software with one-to-one and one-to-few content sharing. Co-design tools and content sharing in repositories dedicated to each thematic area. That is, based on the construction of soft skills and multidisciplinary acculturation: elective paths on contents of related disciplines based on virtual platforms. Webinar cycles with external partners and on topics transversal to the didactic themes offered. Accompaniment in the construction of a professional identity through virtual support of recruitment experts, professional skills and psychologists.

In conclusion, as in the case study but also more generally, a phase of regeneration of the core of the discipline is proposed, to re-evaluate the discipline's center of gravity with respect to its constant extension also through new tools and their effective and efficient use.

The schools have accelerated and validated the experimentation of the integration of new generation collaborative teaching processes that are more elaborative and generative and less emulative and of the introduction of external references and specific contributions on digital platforms that connect to the different disciplines, their skills and their foundations.

"To acculturate" the new generation of designers means "to integrate" these elements into the consolidated cultural background, allowing the digital age first and social distancing then to generate new potential in teaching and in the professional quality of the designers of the future.

References

> Acklin, C. (2011) *The absorption of design, management capabilities in SMEs with little or no prior design experience,* Proceeding Nordic Design Research Conference Helsinki.
> Buchanan, R. (2001) *Design Research and the New Learning.* Design Issue Volume 17, Number 4.
> Friedman, K. (1997). *Design Science and Design Education. The Challenge of Complexity.* Peter McGrory, editor. Helsinki: University of Art and Design Helsinki UIAH, 54-72.
> Herskovits,M. *(2016) Acculturation the study of culture contact.*
> Heskett, J (1980) *Industrial Design.* Oxford University Press.
> Manzini, E. Bertola,P. (2004) *Design multiverso. Appunti di fenomenologia dei design.* Edizioni Polidesign.

> Norman, D.A.& Spohrer, J.C. (1996). *Learner-Centered Education,* Communications of the ACM, Vol. 39, No.4, p. 24-27.
> O. & Demirkan, H. (2003) *Focus on architectural design process through learning styles.* Design Studies Vol. 24, No. 5, 437-456
> Ozkaynak, M & Selin,U. (2012) *New forms of design education,* Elsevier.
> Rovatti, A. (2019) a cura di-*Confini del Design.* ADI per.
> Sam,D.L (2006)*Acculturation: conceptual background and core components"* in Sam, D.L. & J.W. Berry, *The Cambridge Handbook of Acculturation Psychology,* Cambridge University Press.
> Kim, Y. Y. (1988), *Communication and cross-cultural adaptation: An integrative theory.* Multilingual Matters.
> Kroll,E., Condoor S.S., Jansson, D.G. (2001). *Innovative conceptual design.* Cambridge Un. Press, Cambridge.

Motion design in online education

All over the world, in just a few weeks' time, deep changes are taking place in the social and economic field, in the way of living and relating to others. In the training sector, due to the health emergency, the need to provide distance learning led to reflect on tools, methods and processes for training in the "digital age". This article explores the potential of motion design as a tool capable of contributing to greater effectiveness in interaction and distance learning, specifically in design workshops. It introduces historical-pedagogical references on distance learning to frame the issue in the context of project teaching, addressing the problems and the potential that digitization entails. Starting from a critical re-reading of the model of in-person learning, experimented in the motion design workshop in the Faculty of Design G.d'Annunzio of Pescara, the potential of the interactive component of animated language is examined in order, as a research hypothesis, to make distance learning more engaging and effective.
It is believed that motion design can be a valid tool for rethinking and redesigning the design process through the introduction and application of new interactive, hybrid and dynamic methods, to the point of prefiguring an advanced form of design workshop. In addition, the application of interactive motion design to improve the effectiveness of the distance education practice lends itself to interesting scenarios for research on the future development of the discipline.

[communication design, motion design, workshop, online teaching, interactivity]

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The crisis triggered by the planetary pandemic represents a challenge, but also an opportunity for development, for the business world, the culture of design and the training places. In this evolutionary framework, the training field needs careful experimentation to reconsider pedagogy and teaching in the "digital age".

In the field of communication design, motion design, as an expression of the most innovative technologies of contemporary society, represents an interesting field of experimentation.

Today, in the current educational emergency situation, it can provide an important contribution: with its multidisciplinary vocation it is able to prompt continuous integration processes between different know how and knowledge and encourage the search for new boundaries to be explored. How can motion design contribute to learning processes and to an improvement in project teaching? What are the most effective technical and technological tools to achieve these goals?

The purpose of this article is to explore the potential of motion design as a tool capable of promoting greater effectiveness in learning and in interaction for distance learning in design workshops.

Distance learning: historical notes and pedagogical consequences
Following the exceptional measures taken by various countries to respond to the health emergency, the education sector also responds to the pandemic with "emergency e-learning" protocols, which mark the rapid transition from classroom lessons to online learning systems (Murphy, 2020).

The evolution of technology and the new ways of learning have always been in correlation with each other: on the subject in literature, e-learning[1] is proposed as the third phase of development of distance learning[2], its ancestors are identified in correspondence teaching, passing to education spread through the media, radio first and then television, up to the more recent web (Marques, 2013).

In the first two phases, the learning processes lack an important pedagogical factor, the interaction between teachers and students is almost non-existent, it is a one-way communication: in fact, learning is not identified in a social process, but mainly in an individual episode.

Only the spread of the internet and the advent of the multimedia era have opened the way to new possibilities, with infrastructures designed for e-learning and the consequent creation of online student communities.

The network is the virtual place in which the distance learning experiences identified in the third phase are born. The web, in addition to offering a database of information with practically unlimited boundaries to students, presents itself as a virtual place capable of hosting a new series of interactions between the protagonists of the training process. Here students and teachers are able to pool, share questions and answers to generate new questions and new answers, giving life to a process of free learning in terms of contents and methodologies (Attademo, 2006).

It has been a few years since the infrastructures for partially or entirely online teaching have been implemented, but this emergency situation due to the COVID-19 pandemic has imposed an acceleration that was unthinkable until a few months ago. In a few weeks' time changes which in a normal situation would have taken years to come, have been faced.

To date, the videoconferencing systems used allow the reproduction of the lesson, previously recorded or in streaming, at a distance; they also allow for forms of interaction between students and teachers thanks to social platforms and the creation of virtual communities. This system, already tested by online universities and other free or paid online teaching systems[3], has now in fact become the only training method that can be practiced.

The advantages of e-learning are numerous and widely described in the dedicated literature (Abaidoo, 2015; Radović-Marković, 2010). The most obvious are that the lessons are accessible to a potentially unlimited number of participants and that users have access to educational content, even remotely, i.e. the opportunity to watch the professor's dissertation several times. However, these favorable elements are contrasted by the most evident disadvantage, namely the lack of direct, face-to-face interaction between teacher and students. The computer screen constitutes an artificial diaphragm which makes it very difficult to go beyond the mere transmission of notions with the virtual relationship.

The distance learning project
From these historical and pedagogical premises on distance learning, we understand how the crisis has allowed university education to experience some potential for the future of teaching. Strengths and weaknesses emerged. On one hand, the technologies available make it possible to establish human relationships even in a virtual environment, on the other hand, it is not possible to expect that training at a distance means transmitting the same contents with different tools. It is essential to re-design processes and methods. Above all, it becomes necessary in the teaching of the project delivered in the form of a workshop. The problem due to interpersonal distancing raises, in fact, issues that affect the fundamental aspects of teaching in terms of method, content and ethics. All this entails reconsidering the relationship between design, teaching and research, which represents one of the crucial points of the discipline and its development prospects.

In recent years, training and academic research in the sector have mainly been oriented towards theoretical and methodological topics, not applicative ones, thus favoring a critical and reflective approach to the subject, but neglecting the "material" culture of the project in its various dimensions and degrees of complexity. Teaching to design is transmitting to students the ability to develop learning devices *learning to learn by doing*, «already theorized and tested in cognitive sciences especially by Harry F. Harlow» (Chiapponi, 1999, p. 107). In this type of teaching, therefore, the fiduciary and emotional relationship between teacher and students takes on a role of primary importance. Social

distancing creates difficulties in collaboration between students and with teachers. There are several theories that value the dialogue of students among peers as fundamental in the learning path: Vygotsky in his 1986 text "Thought and language" argues that learning is a socially mediated activity and that concepts and skills are acquired only after having been tested in a collaborative context. Today, thanks to specific tools, these interactions can take place digitally, through video, audio, text, shared spaces and shared virtual reality simulations. (Beetham & Sharpe, 2019)

It can reasonably be said, on the basis of various, although limited, experiences carried out in different training fields, that the laboratory lends itself to possible collaborative learning experiments. The work organized in groups allows an obligatory flow of continuous information, preventing the student from isolating himself in the didactic environment. Furthermore, not only do small group activities lead to learning communities and provide students with a platform to discuss questions about course material, but they also help students strengthen peer relationships and build connections within social distancing in an academically productive way.

Therefore is it possible, with a simple transfer operation, to bring back the usual activities, relationships and methods of interaction of teaching in presence in a remote laboratory, or, in order not to give up relational and emotional moments between teachers and students and between students themselves, is it essential and urgent to reconsider the form and meaning of the online project laboratory?

Motion design for distance learning in project laboratories
Motion design is a discipline that constitutes a synthesis between various complementary subjects such as animation, graphic design, music, interactive design and visual communication. Animated language has always been used to convey complex content in a captivating and effective way (Stone & Wahlin, 2018). Steven Heller in his 2008 text "Teaching Motion Design" underlines how essential it is to introduce the motion component in the study path of a graphic designer, as animated graphics with its immediate, fluid and dynamic character integrally represents the way of thinking of the new generations of design students. In the last twenty years this discipline has been introduced in university teaching programs precisely to respond to the demands of a technological culture of a dynamic society in continuous evolution. Heller writes «Graphic designers are migrating into fields that were once exotic, but now are endemic. [...] Static is out, movement is in" (Dooley, M., & Heller, S., 2008, p. XI). Motion design is a relatively young discipline and to date there are still few universities that have taught it within their degree course.

For the new figure of the motion designer, if in the past the professional path was that of a graphic designer who learned to animate his work on the timeline[4], today it is a profession with many skills that go from 2D to 3D up to 4D, from products for cinema to products for the web and virtual reality made with the most advanced technologies and software (Shaw, 2020).

Training in this field is strongly aimed at offering practical skills and leading to software learning; this derives from the need to keep pace with the technological development of the last decades. Together with the practical component, the complexity of the discipline requires a theoretical part on the history and techniques of animation, on video and multimedia platforms.

The learning model of motion design was concretely applied and verified in a design laboratory in the Faculty of Design of Pescara University G.d'Annunzio. The organizational methods of the laboratory have the ultimate aim of guiding students through the phases and processes that lead to the realization of a motion design project through the development of critical reasoning and the knowledge of software tools. Theoretical lessons on the history and techniques of animation are accompanied by practical lessons in specific 2D and 3D software that allow students to become familiar with the world of the animation video. The intent of the laboratory is to simulate a path similar to what happens in professional reality: we arrive at the final artifact after the pre-production and production phases. To complete the design exercise, good planning is essential: starting from the concept, the script of the story, the first sketches for the storyboard, the definition of the graphic style, up to the technical considerations concerning the software and formats for the outputs depending on the target platforms. Students, starting from the definition of a project theme, face all the pre-production phases in the first six weeks: concept, style frames[5], storyboard and design board[6], which end in the production of a process book that collects all the material and is presented in the classroom to the teachers and classmates of the course. Through theoretical lessons and four workshops on learning software, students learn the basics of animation techniques and the main tools to perform them. The production phase contains everything that leads to the final artifact: the preparation of assets, animation, compositing[7], rendering and export for the final output platforms.

Students work in groups and through in-between reports and reviews they interact with the teachers and with each other: in this way the progress of the laboratory is monitored and the students are able to modify the audiovisual project based on the feedback of the teachers and the comparison with other classmates. The comparison with teachers and with other students are certainly essential elements to humanize distance learning, but the request for a more human approach to online learning requires studying and experimenting new ways to be present on the web in order to make the experience as real as possible (Themelis & Sime, 2020).

Starting from the historical premises on distance learning and on the basis of the theoretical and applicative knowledge acquired, the hypothesis is that within the remote project laboratory, motion design constitutes a valid experimentation tool that can support learning and interaction, in order to resolve, at least in part, the problems related to social distancing in the context of university education.

Animated language has a long history of use in education and in the first half of the 20th century numerous animated documentaries with a pedagogical background were already produced (Roe, 2013) and its use in higher education has been studied in recent years[8]: from these contributions it emerged that animation contributes to the learning of complex topics and to stimulate the involvement and interest of students. In the current context of an educational emergency situation, the flexibility of a motion design product that, entirely put together digitally, can be easily adapted to different platforms, translated into different languages and quickly updated, proves to be very useful. In addition to these quick customization possibilities, the most interesting element that can be inserted in the animated video is the interactive component. Interactivity in videos has been gaining ground in the last few years, even Netflix has addressed questions to viewers of a TV series[9] to decide the next moves of the characters. An interactive video for teaching incorporates moments of interactivity within the reproduction allowing students to participate in the learning process in numerous ways (Gedera, 2018). The interactive component, combined with animated language, can be used in teaching to obtain feedback from students and monitor the progress of the course.

Through the introduction of an overlay box, which during the video can provide details to the teacher's speech and links for further information and questions, students can be involved more effectively and their participation can be stimulated even in the remote virtual classroom. Modern technical-didactic models suggest that multimedia programming and development tools must be used with great care and the right proportions (Francescone, 2012): in this sense, the interactive component within an animated video can prove to be an interesting experiment as it highlights its dynamism and interest without diverting attention from the storytelling of learning aimed at transferring knowledge and skills.

From the historical analysis of the context and on the basis of the current acknowledged results, although inhomogeneous, related to distance learning experimented in universities all over the world, it emerged that the main problem lies in the difficulty of ensuring a sufficient level of involvement and interaction among students. The problem of interaction during the recorded or live lesson, is indeed still an unresolved issue.

It is believed that, based on the knowledge of the project laboratory model based on motion design in presence carried out in the University G.d'Annunzio of Pescara, it is possible to take advantage of the characteristics of the animated language, through the integration of the interactive component, to start an online exercise experiment that allows the student to actively participate in the construction of the learning path and the teacher to monitor the progress of the course through feedback from students. Today, it is possible to experiment with the interactive component of animated language in university design training in order to understand how to draw the maximum potential from the new technologies available. The animated interactive product can be easily integrated into the digital video, involving the student through questions, insights on the proposed topic and allowing him to interact with fellow students and teachers within the virtual classroom.

The implications of this technological experimentation in the field of motion design may constitute an interesting research starting point for the discipline itself, as well as for distance learning. The already enormous potential of this communication tool, combined with the participation that allows the interactivity of the video, represent an area of research that is currently unexplored and is suitable to being a resource for many fields of application.

[1] The term e-learning refers to the use of multimedia and Internet technologies to improve the quality of learning by facilitating access to resources and services, as well as to remote exchanges and remote collaboration.

[2] Distance learning is the set of didactic activities carried out within an educational project that involves the non-presence of teachers and students in the same place.

[3] Reference is made to the MOOC Massive Open Online Courses; these are courses designed for distance learning that involves a large number of users.

[4] In the language of animation, the English term timeline indicates the bar that represents the passage of time within the software.

[5] The style frames exemplify the style chosen for animation in a static image.

[6] The design board is the set of style frames and represents storytelling by placing the events in a chronological order.

[7] Compositing is the combination of visual elements from separate sources to make them part of the same scene.

[8] For an in-depth analysis, we recommend consulting Xiao (2013) "Animation trends in education", Kumar & Jamil (2016) "Enhanced learning using motion graphics in higher education" and Lowe & Schnotz (2008) "Learning with animation".

[9] Reference is to "Bandersnatch" an interactive film released on Netflix on December 28, 2018 part of the "Black Mirror" series.

References

> Arkorful, V. and Abaidoo, N. (2014) The Role of e-Learning, the Advantages and Disadvantages of Its Adoption in Higher Education. *International Journal of Education and Research*, 2, 397-410.
> Attademo, G. (2006, 4 16). Università ed e-learning: tra teoria e pratica dei nuovi contesti dell'alta formazione. *Comunicazione Filosofica,* p.104-116.
> Beetham, H., & Sharpe, R. (2019). *Rethinking Pedagogy for a Digital Age: Principles and Practices of Design.* New York: Routledge.
> Brian Stone, R., & Wahlin, L. (2018). *The Theory and Practice of Motion Design: Critical Perspectives and Professional Practice.* New York: Routledge.
> Chiapponi, M., (1999). *Cultura sociale del prodotto: Nuove frontiere per il disegno industriale.* Milano: Feltrinelli.
> Dooley, M., & Heller, S. (2008). *Teaching Motion Design: Course Offerings and Class Projects from the Leading Graduate and Undergraduate Programs.* New York: Simon and Schuster.
> Francescone, P. (2012). Augmented reality and learning: the path to edutainment, advanced solutions in instructional design. *Formamente*, Anno VII(3-4), p.281–298.
> Gedera, D. & Zalipour, A. (2018). Use of interactive video for teaching and learning. In *Open Oceans: Learning without borders.* Proceedings ASCILITE 2018 Geelong p. 362-367.
> Kumar, M., & Jamil, M. (2016). Enhanced learning using motion graphics in higher education. *Iceri* 2016.

Proceedings of International Technology, Education and Development Conference.
> Lowe, R., & Schnotz, W. (2008). *Learning with Animation: Research Implications for Design.* Cambridge: Cambridge University Press.
> Marques, J. (2013). *A short history of MOOCs and distance learning.* Visitato il 10/06/2020, da http://moocnewsandreviews.com/a-short-history-of-moocs-and-distance-learning/
> Michael P. A. Murphy (2020) COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy, *Contemporary Security Policy,* 41:3, p. 492-505.
> Radović-Marković, M. (2010). *Advantages and disadvantages of e-learning in comparison to traditional forms of learning.* Annals of the University of Petrosani Economics.
> Roe, A. H. (2013). *Animated Documentary.* London: Palgrave Macmillan.
> Shaw, A. (2020). *Design for motion.* New York: Routledge.
> Themelis, C., & Sime, J.-A. (2020). From Video-Conferencing to Holoportation and Haptics: How Emerging Technologies Can Enhance Presence in Online Education? In *Emerging Technologies and Pedagogies in the Curriculum* (pp. 261–276). New York: Springer.
> Vygotsky, L. (1986). *Thought and language.* Cambridge: MIT Press.
> Xiao, L. (2013). Animation Trends in Education. In *International Journal of Information and Education Technology.* p. 286–289.

Design Education for world citizenship

This article reflects on the concepts of citizenship and cosmo-politanism and how they can contribute in expanding the value and scope of education beyond the mere accumulation of skill and knowledge. Citizenship ought to be understood as partici-pation, activism and responsibilities towards the social life and public good (Sicurello, 2016, p. 75). A cosmopolitan citizenship education aims to form world citizens who can act in the interest of the entire ecosystem to which they belong. Cosmopolitanism and citizenship are therefore necessary words for articulating a language of care that can help us relate more intimately and empathically with the world and with each other. There is a real need to speak this language at a time of great social inequalities, growing nationalisms, and ecological destructions. These are things that are not happening to us but reflect things that we are doing to the Earth.

Design and architecture are disciplines devoted to the under-standing and influencing of the relations between humans and their objects, between people and their places, between present and future conditions. Therefore, they are ripe with opportunity to contribute to repairing these many design faults. Education matters: the way we educate students today will influence their future practice. Design and architecture schools therefore need to teach critical, empathic, relational, and social skills so that the next generation of professionals can operate with care as world citizens. A cosmopolitan citizenship design language can help designers and architects to acquire multiple roles such those of ethical professionals, active storytellers, dissident intellectuals and guardians of the common good. Cosmopolitan citizens who tell stories of how Earthlings live and can live harmoniously together.

[design, architecture, education, cosmopolitanism, citizenship]

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Teaching to design for cosmopolitan citizenship.
Each design project is a storyof how we live and could live together.
Designer Milton Glaser has said that "good design is good citizenship" (Heller & Vienne, 2003, p. ix), architect Lina Bo Bardi has defined good architecture as the "science and art of collective responsibility" (Veikos, 2014, p. 66); whilst designer, architect, and educator Walter Gropius has stated that "the social component (of architecture and design) is more valuable than the technical, economic and aesthetic components" (Veikos, 2014, p. 172). Citizenship and collective respon-sibility can help designers writing new stories, expanding therefore not just their language but their possible societal missions.

A recent research conducted among current students and educators in design and architecture from sixteen universities in the Nordic Baltic Europe reveals participants' intentionsto be world citizens designers,by expandingtheir societal rolesin multiple ways: as ethical professionals, as storytellers, as dissident intellectuals, andas guard-ians of the common good (Santanicchia, 2020). Confidence, commitment, creativity, competence, communication, cooperation, collaboration, courage, connection, and care have emerged from the above mentioned research as fundamental behaviours/ words necessary for educating a new generation of designers capable to operate as cosmopolitan citizens,to act ascritical thinkersequipped with systems thinking and feeling, as passionate earthlings capable of responding and repairing with collab-orative careimportant global issues affecting us all:social inequalities, growing nationalisms, and ecological destructions (Santanicchia, 2020).
The concept of Cosmopolitan Citizenship Design Education (CCDE) is born in the Nordic-Baltic context but its story is universally applicable.This paper argues: theneedfor CCDE and how it can form a designers' language of care foreach other.

On December 10th, 1957 philosopher Albert Camus in his acceptance speech for the Nobel Prize in Literature said:

Each generation doubtless feels called upon to reform the world. Mine knows that it will not reform it, but its task is perhaps even greater. It consists in preventing the world from destroying itself.

Since then, Baby Boomers and Generations X, Y, and Z have had their chances of keeping the world from destroying itself, and yet it seems that we have never been as close to self-destruction as we are today. Since 1957 humanity has wiped out 60% of animal populations (Carrington, 2017). This extermination of life known as the *Sixth Great Extinction* (Chomsky & Polychroniou, 2017, p. 132)is a frightening assault, not only on the planet as a living environment but also on the foundations of human civilisation (Carrington, 2017). At the same time life expectancy has increased tremendously (Rosling, 2018).We are constantly generating knowledge

through research and experimentation, and by doing so we have come to understand the workings of many natural phenomena. These achievements are accompanied by catastrophic situations such as unprecedented social inequalities and the climate crisis, which is decidedly connected to the emergence of zoonotic diseases (Klein, 2014; Quammen, 2013). These conditions leave us dazed and confused. We feel at the edge of a precipice, we know that humanity is deeply undermining its position within the web of life, and yet life continues.

As I am writing this paper, worldometers.info counts 7,813,544,490 human beings. 67% of us own mobile phones and 57% have internet access (Kemp, 2019). We share information at record speed; in July 2015 YouTube users were uploading 400 hours of video content every minute, or 210 billion hours of videos per year, (Hartley, 2017, p. 77). These astonishing levels of comfort and hyper-connectivity coexist with a state of anxiety, apathy, and passive citizenry (Colomina & Wigley, 2016, p. 85). In 1908 philosopher and educator John Dewey defined this passivity as 'Kodak fixation', that is, the "photographic attitude that reduces the citizen's role to that of a spectator, detached from that which is experienced" (Thackara, 2015, p. 161). Dewey also stated that "democracy has to be born anew in each generation, and education is its midwife" (hooks, 2010, p. 14). Dewey believed that education was fundamental not only to the transmission and creation of knowledge but also to the development of empathic and social behaviours essential to promote action and participation in the democratic life of our society.

The role of Education
The United Nations UN includes "quality education" as one of the 17 Sustainable Development Goals for the year 2030; specifically, it aims to:

ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development (UN, 2020).

Education is the foundation for ecological and social justice movements, for recognising the value that derives from diverse human cultures, and for building shared interests for a common future. We are, after all, citizens of the same planet, and we need to be educated to behave as such.

The ongoing environmental crisis and the understanding of its social and political consequences needs to constitute the premise and scope of scholarly investigation. It needs to be part of the educational discourse, form our individual and collective planetary consciousness, and further contribute to bond world citizens in working

together towards their resolution. This crisis reflects in fact not our lack of knowledge and professional skills but our inability to fully relate and empathise with each other, to other Earthlings, and to our planet as a whole. It reflects things that we are doing to the Earth, not just things that are happening to us (Quammen, 2013, p. 515). Knowledge alone is therefore not enough to form sound education. We need to understand how knowledge is formed and used, whose interests it serves, and who will benefit from it. Research, which is always at the base of the creation of knowledge, "is not an innocent or distant exercise but an activity that has something at stake and that occurs in a set of political and social conditions" (Smith, 2012, p. 5). These political and social conditions must therefore be understood so that knowledge can truly contribute to benefitting all Earthlings.

In 1967, philosopher Theodor Adorno wrote "Education After Auschwitz" in which he argued that as long as the school system prioritises the learning of skills over values, another Auschwitz would always be possible. Specifically, Adorno states:

All political instruction finally should be centred upon the idea that Auschwitz should never happen again. This would be possible only when it devotes itself openly, without fear of offending any authorities, to this most important of problems. To do this, education must transform itself into sociology, that is, it must teach about the societal play of forces that operates beneath the surface of political forms (Adorno, 2003, p. 32).

Scholar and educator Henry Giroux, in his paper "Critical Theory and Rationality in Citizenship Education", states that citizenship education is based on critical thinking, social awareness, and action (Giroux, 1980). Critical thinking requires challenging the status quo and re-examining old practices and established beliefs. Social awareness is about developing empathic behaviours to understand the conditions of Others. Social action means having the courage to pursue ideas beyond the classroom into the world. Citizenship education requires an openness in guaranteeing that all learners have equal access to education, and that the educational community truly represents the diversity of the world that it is intended to serve (Froud & Harriss, 2015). The concept of cosmopolitanism helps to further enlarge and enrich the one of citizenship education.

Philosopher Martha Nussbaum defines a cosmopolitan citizen as "the person whose allegiance is to the worldwide community of human beings" (2010, p. 154). This simple definition is dense with implications worth exploring in its possible applicability to the field of education, and in particular to the field of design and architecture education. Anthropologist David Harvey defines cosmopolitanism as the common quest for universal social justice, the struggle that leads to emancipation and freedom (2009). The pursuit of this task implies the existence of "social solidarities and a will-

ingness to submerge individual wants, needs, and desires for the cause of some more general struggle for, say, social equality or environmental justice" (Harvey, 2005, p. 41). Cosmopolitanism can be achieved only through dialogue and empathy among different parties, only if we are capable of using our knowledge with compassion and care for all Earthlings and future generations, only if we work together in developing social forces to form common policies. Cosmopolitanism means recognising the differences among us all, our diversity, our individual intrinsic value, whilst also recognising similarities, common biology, and common grounds. Cosmopolitanism honours the strong bonds humans have with their own place, city, village, territory, with their local context; at the same time, it acknowledges that we are also part of something bigger, something truly great and truly common: the world.

In a time of growing nationalisms, xenophobic attitudes, and exclusionary forces, which impair the formation of a global vision, the spirit of world citizenship must be advocated and supported in schools and beyond. We need to behave as citizens of the natural world bound to a common destiny, and as such act responsibly to protect the common good by promoting environmental and social justice, caring for our planet and its Earthlings, and caring for the education of future generations. Cosmopolitanism and citizenship education are at the base of forming a language and shape behaviours that can help us relate more intimately and empathically to the world and to each other. Thesetogether will help us to overcome national prejudices, racial discriminations, and ecological abuses, by helping us see the strong bonds that exist among us all and our world.

A cosmopolitan citizenship education is therefore indissolubly linked to the quest for social and ecological justice.Schools must therefore serve as platforms for collaboration, cooperation, communication, and care; as nurseries to grow confidence, competence creativity and courage to connect and care for all the Earthlings.

Co-creative partnership with Earth
In his recent opening remarks at the World Health Assembly WHO, Director General Tedros Adhanom stated:

The pandemic crisis caused by Covid-19 has brought out the best – and worst – of humanity: Fortitude and fear; solidarity and suspicion; rapport and recrimination. This contagion exposes the fault lines, inequalities, injustices and contradictions of our modern world. It has highlighted our strengths, and our vulnerabilities. Whatever lessons there are to learn from this pandemic, the greatest failing would be to not learn from them, and to leave the world in the same vulnerable state it was before. Now more than ever, we need a healthier world. Now more than ever, we need a safer world. Now more than ever, we need a fairer world. Healthy, safe and fair. And now more than ever, we need a stronger WHO. There is no other way forward but together(WHO, 2020).

The goal of a cosmopolitan citizenship education is to care for the world and contributing in repairingit together, in making it healthier, safer and fairer for all. Economist and educator Kate Raworth, in her book *Doughnut Economics*, states that the most powerful tool in economics is not money but a pencil, "because with a pencil you can redraw the world" (2017, p. 1). Designers must therefore "be professionally, culturally, and socially responsible for the impact [their] design has on citizenry" (Heller & Vienne, 2003, p. x). Designers have to make sure that their work will make the world healthier, safer and fairerand to do so they must learn to relate, listen, collaborate, and cooperate with each other and other Earthlings. Design is about choices, and these choices are what ultimately make us human: "design is the basis of social life" (Colomina & Wigley, 2016, p. 12).

Capitalism and neoliberalism have formed the story of *homo economicus* and educated us to compete with each other and to exploit the Earth's resources, to extract the last ounce of gold or the last barrel of oil. These ideologies have formed a language of exploitation and dominance, in which natural resources are treated as commodities instead of precious finite goods; in which the word 'sustainability' has become an empty vessel intended to sustain current and future industrial production with no consideration as to how the biological and cultural diversity of the world can be enhanced (Butman, 2016). It is time to challenge this story, to develop alternative stories that tell of *homo oecologicus*: a caring relational being who respects and values each Earthling and each natural wonder.

These stories should be vast and inclusive and should transgress the limits of Western culture and embrace Other wisdoms. New Zealand authorities have rewritten the story of citizenship by extending it to natural resources (Garbarczyk, 2019). Te Urewera forest and Te Awa Tupua river were conferred citizenship in 2014 and 2017, respectively. In the culture of the indigenous people of Aotearoa (New Zealand), the Māori, there is no separation between physical and spiritual lives, and we are all connected in reciprocal relations. In the words of Gerrard Albert, a Māori leader and environmental resource manager: "We can trace our genealogy to the origins of the universe, and therefore rather than us being masters of the natural world, we are part of it" (Roy, 2017). Being a part of something means acknowledging the presence and the value of Others and care for it, as essentials for your own existence.

With this renewed spirit of care, new stories can be told so that Camus' appeal to *keeping the world from destroying itself* can be constantly guarded and updated. We must learn to speak a language that truly celebrates the multitudinous, rich, and complex system of connections and interrelationships that constitute life on Earth (Hollis, 2013, p. 127). This language must be formulated, learned, practiced by this generation, and passed onto future ones; it is a collective effort that will allow us to write new stories about ourselves and how we can act in the interest of Planet Earth,

and therefore create a new sense of purpose. Education is fundamental to transmit this language.

Design and architecture education can tell stories about distinct interconnected Earthlings who can survive because of each other's support. Each story will be unique, and each story will shape our common future in a distinct way. Each story is a project that can regenerate our interests in each other and in our world. These new stories should join culture and nature, economy and ecology, and natural and social sciences, design with the world; these new stories need to be about interconnections, recipro-cations, interdependencies, and consiliences, or as author Charles Eisenstein put it, "being together in co-creative partnership with the Earth" (Raworth, 2015, p.116). These new stories can help designers to be citizens of the world and to relate and care with our own physical and social world more intimately.

Educators and students form the learning communities from which professionals emerge. These communities have to be empathic and inclusive; the academic bounda-ries must transform into porous territories receptive to the voices of Others. If "design has become the world" (Colomina & Wigley, 2016, p. 9), then we must educate the next generation of designers to speak a language understood by the whole world andtell stories of how we can live harmoniously together as *homo oecologicus*. Stories are important; they shape our vision of the world and influence how we relate to it and to each other. "It was writing that gave modern architects a new vocabulary and the means to change the way we talk about architecture. The modern gaze was constructed not just by built manifesto-houses and exhibitions, but by texts and illustrated magazines" (Rubino & Bo Bardi, 2013, p. 5).

A cosmopolitan citizenship design language describes the value and the necessity of cooperation, as well as the beauty that comes from working together to solve complex problems. It helps us develop a global conscience and shape societal plays that are fairer and more just for all. Educating for cosmopolitan citizenship means educating people to nurture common responsibilities, solidarities, and care for Others. This is at the core of what a cosmopolitan citizenship design and architecture education should be about. Each school must act therefore as a community of learners devoted not only to forming and sharing knowledge but also to the promotion of a culture, language, behaviours for peace and non-violence, in order to form world citizens who actively pursue ecological and social justice. Cosmopolitan Citizenship Design Education narrates stories of how we can live, and will live, harmoniously together.

I dedicate this article to my friend and teacher of life Maria Grazia Fioriti.

References

> Adorno, T. W. (2003). *Can one live after Auschwitz? a philosophical reader* (R. Tiedemann, Ed.). Stanford Univ. Press.
> Bo Bardi, L., & Rubino, S. (2013). *Stones against diamonds.* AA Publications.
> Butman, J. (2016, August 8). *Against Sustainability.* The New York Times. http://www.nytimes.com/2016/08/08/opinion/against-sustainability.html?smid=tw-nytopinion&smtyp=cur&_r=1
> Carrington, D. (2017, July 10). *Earth's sixth mass extinction event under way, scientists warn.* The Guardian. https://www.theguardian.com/environment/2017/jul/10/earths-sixth-mass-extinction-event-already-underway-scientists-warn
> Chomsky, N., & Polychroniou, C. (2017). *Optimism over despair: on capitalism, empire, and social change.* London: Haymarket Books.
> Colomina, B., & Wigley, M. (2016). *Are we human? notes on an archaeology of design.* Zurich: Lars Müller.
> Froud, D. & Harriss, H. (Eds.). (2015). *Radical pedagogies: architectural education and the British tradition.* Newcastle upon Tyne: RIBA Publishing.
> Garbarczyk, M. (2019). From edge to core: Realigning sustainability in architectural education. In Agrawal, A., & Gupta, R. (Eds.), *Proceedings Revisiting the Role of Architecture for 'Surviving' Development.* 53rd International Conference of the Architectural Science Association. (pp. 635–644). Auckland: ANZAScA.
> Giroux, H. (1980). Critical Theory and Rationality in Citizenship Education, *Curriculum Inquiry*, Vol. 10, No. 4 (Winter, 1980), pp. 329–366. Published by: Blackwell Publishing on behalf of the Ontario Institute for Studies in Education/University of Toronto.
> Giroux, H. (2011). *On critical pedagogy.* London: Bloomsbury.
> Hartley, S. (2017). *The Fuzzie and the techie, why the liberal arts will rule the digital world.* Boston: Mariner Books.
> Harvey, D. (2005). *A brief history of neoliberalism.* Oxford: Oxford University Press.
> Harvey, D. (2009). *Cosmopolitanism and the geographies of freedom.* New York: Colombia University Press.
> Heller, S., & Vienne V. (Eds.). (2003). *Citizen designer: perspectives on design responsibility.* New York: Allworth Press.
> Hollis, L. (2013). *Cities are good for you: the genius of the metropolis.* London: Bloomsbury Press.

> Hooks, b. (2010). *Teaching critical thinking.* London: Routledge.
> Klein, N. (2014). *This changes everything: capitalism vs. the climate.* London: Allen Lane.
> Kemp, S. (2019, January 31). *Digital 2019: global digital review.* https://datareportal.com/reports/digital-2019-global-digital-overview
> Nussbaum, M. (2010). Patriotism and cosmopolitanism. In Brown, G. W., & Held, D. (2010). *The cosmopolitanism reader.* (pp. 154–162). Cambridge: Polity Press.
> Nobel Prize. (1957). https://www.nobelprize.org/prizes/literature/1957/camus/speech/
> Quammen, D. (2013). *Spillover: animal infections and the next human pandemic.* London: Vintage.
> Raworth, K. (2017). *Doughnut economics: seven ways to think like a 21st century economist.* London: Random House.
> Rosling, H. (2018). *Factfulness.* London: Sceptre Books.
> Roy, E. A. (2017, March 16). *New Zealand river granted same legal rights as human being.* The Guardian. https://www.theguardian.com/world/2017/mar/16/new-zealand-river-granted-same-legal-rights-as-human-being
> Santanicchia, M. (2020). "Becoming Citizens Architects, A Reflection on Architectural Education Across the Nordic Baltic Academy of Architecture NBBA: A Student's Perspective". In Roth, M., & Cavallo, R. (Eds.), Conference Proceedings: EAAE, The Hidden School Papers (pp. unknown). Delft: TU Delft Open. ISBN: 978-94-6366-315-1
> Sicurello, R. (2016). Educazione alla cittadinanza: significati, linee di ricerca, finalità epratiche didattiche. Foro de Educación, 14(20), 71-103. doi: http://dx.doi.org/10.14516/fde.2016.014.020.006
> Smith, L. T. (2012). *Decolonizing methodologies: research and indigenous peoples.* London: Zed Books.
> Thackara, J. (2015). *How to thrive in the next economy: designing tomorrow's world today.* London: Thames & Hudson.
> UN Nations. (2020). #Envision2030. https://www.un.org/development/desa/disabilities/envision2030.html
> Veikos, C. (2014). *Lina Bo Bardi: the theory of architectural practice.* London: Routledge.
> World Health Organization. (2020). WHO Director-General's opening remarks at the World Health Assembly. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-world-health-assembly

Aesthetics of Design Processes

The "traditional" values of design: morphology, aesthetics, semiotics and sensorial qualities, inhaling in products their emotional relation to the user, distinguish the discipline from other engineering disciplines. The question this paper wants to investigate is the way of how these values still dominate the design process in an always more immaterial world, and how educational models can drive the required change of knowledge for a new generation of designers. The illustrated case refers to the innovative approach of the Duabi Institute of Design and Innovation (DIDI), a new established Design University in the United Arab Emirates. This through the specific experience of a workshop-like Course that guides the students between analogue and digital explorations in a seamless and non-linear way, as a narration tool, a constructive method of storytelling inside the product development and a methodology to exploit different technologies beyond their superficial *raison d'etre*.

The theoretical contributions related to define a form in design underlies different methods, rules and proportional studies, as well as material characteristics and surface treatment. The maxim "Form Follows Function" is a principle associated with 20th-century modernist has been influencing for decades the form giving decisions. But the processes which guide our all lives have changed: the world has become timelessly digital; everything is at the same time everywhere available. Design has become a process rather than a definition of a form, has become a service rather than a function. Consequently, this influences the way of how designer will need to be able to narrate the process, the immaterial service, the augmented reality of physical objects.

[design aesthetics, sensorial qualities, immaterial, critical design, design education]

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Designing a Problem

Human beings have always been looking for answers to unanswered questions and different disciplines contribute to the understanding and imagination of the unexplored part of our world: religion, philosophy, science and art. From these, philosophy has always been the main discipline regarding designing a problem and to discuss it. In a world of philosophical imagination, reality can have all kinds of shapes and possible consistency until it gets confirmed by science. Different from philosophy and science, art has historically been an expression of exquisite craft, while today it is commonly understood as the subjective expression of feelings, which especially in contemporary art often confine in visual protest against socio-political conditions. An interesting point to explore is, what would happen if this criticizing, accusing approach is included in the design process, meaning that emotions meet rationality.

Taking as reference the Chest of Drawers "Venus" by Salvador Dalí and Marcel Jean's "Drawer Tree", we can state that none of them has the aim of fulfilling the supposed function of storing items but want to make a statement. While in Dalí's "Venus" the artistic aim is clear, however in Marcel Jean's "Drawer Tree" the observer might keep thinking that it is meant to be an "artistic design", which Bruno Munari calls an object of illusive "applied arts". Munari sees the confusion between art and design as a misunderstanding and locates its origin in the structure of the first Bauhaus, where architects and artists worked together to create the new "aesthetic operator" which is the designer (Munari, 1971).

When Dunne and Raby defined the term "Critical Design", they exposed design to the context of antidesign, like Marcel Jean did with his chest of drawers:

Critical Design uses speculative design proposals to challenge narrow assumptions, preconceptions and givens about the role products play in everyday life. It is more of an attitude than anything else, a position rather than a method. Its opposite is affirmative design: design that reinforces the status quo (Dunne, 2008, pag. 43).

In this case, design becomes a tool of narrative protest, and does not want to discuss and provide an effective, producible solution. As a result, it is legitimate to question about the value of design itself:

[Critical Design] is political, because Dunne and Raby not only make the distinction but also attach strongly value judgments to it: affirmative design is the common practice, and this practice is amoral and ultimately a dupe for capitalist ideology, while critical designers are described as moral agents who seek to change society for the better (Bardzell & Bardzell, 2013, pag. 3).

There are many artistic "design-objects" which are famous and also reach communities which are not involved in the design discussion. To mention a couple of

examples, from the "Catalogue d'Objets Introuvables", published by the artist Jacqyes Carelman in 1969, the Coffeepot got famous being the book cover of the influential book "The Design of Everyday Things" by Donald Norman, who illustrated the psychological dimension of design in 1988. Bruno Munari always liked to joke in a way using design, and his "Chair for short visits" is an Italian Icon since 1945. Not meant to sit on, but to demonstrate the intricate value of a chair and how easy it can be put upside-down, this design-object was a big success for its producer Zanotta. It is evident that this kind of designs generate awareness, show elements that make people think off. They are making a statement, at the same time they play with human perception generating a positive, joyful feeling. Being critical gives the chance to be constructive, to give a positive input to thinking and this is not different in design. «Critical Design is a form of research aimed at leveraging designs to make consumers more critical about their everyday lives, and in particular how their lives are mediated by assumptions, values, ideologies, and behavioural norms inscribed in designs» (Bardzell & Bardzell, 2013). Modern design methodologies go beyond the realisation of a product and look at systems, structures and categories. Yet, if Critical Design is being the expression of a position rather than being a solution or seeking for it, it is an artistic tool applied in the field of design using its language. Tobias Revell believes, on some fundamental level that it's design because it uses the language of design to try and attract an audience. Because (…) it rearranges existing phenomena we can understand to give them new meaning and because it's for other people, not for the creator (Revell, 2013).

It is part of "critique-based forms of design", like speculative design, anti-design, radical design, adversarial design or discursive design. But, the one who understands design as a tool to improve the quality of life and does not want to end up with the mere "act of stating a position", needs a solution to an initially stated problem and, consequently, needs to follow the strategies of philosophy and not art. To link the necessity with the tool, the experimental part of the "artistic" approach will be enough to gain a result. Even the Critical Design Initiator Anthony Dunne recognises this point: «it can be useful to refer to certain approaches to design as critical design or speculative design for purpose of debate» (Poynor, 2016).

Provoking means Emotional Involvement
Resuming we can state that, while philosophy by questioning wants to trigger logic answers (of the unknown) and corresponds to affirmative design methods, the artistic approach like the Critical Design theory aims for emotional reactions. Emotions are an important part of human psychology and reason for decisions and reactions. Based on the theories of Donald Norman, «Emotional design is an important element when generating ideas for human-centred opportunities. People can more easily relate to a product, a service, a system, or an experience when they are able to connect with it at a personal level» (2005). Consequently, successful design strategies refer to positive emotions, in order to provoke the sense for a better life and better environment. The thesis of R. Baumeister ed altri states that «Human conscious emotion operates mainly and best by means of its influence on cognitive processes, which in turn are input into decision and behaviour regulation processes» (Baumeister, Vohs, DeWall & Zhang, 2018). Furthermore, contemporary psychology permit «that people can also be conflicted or ambivalent toward an object by simultaneously holding both positive and negative attitudes toward the same object. This has led to some discussion of whether individual can hold multiple attitudes toward the same object» (Wood, 2000). In other words, we are not helpless in the hand of our own emotions, but they are a feedback system for our good or bad actions. Emotions build our future, they generate a behaviour pattern in human beings based on experiences, related reactions and future consequences. This, obviously, has influence on design. And to be more aligned, «Designs makes futures. What designers make becomes the futures we inhabit» (Tonkinwise, 2005).

Including emotional aspects in the design process, the resulting Design Aesthetics will go much further than only form, material and finishing: until today, morphology and formal principles are the basic components to shape a product. The maxim "Form Follows Function" is a principle associated with 20th-century modernist which influences still today the form giving decisions. But the world has become timelessly digital, everything is at the same time everywhere available, more perceived than ever throughout the pandemic emergency which needed social segregation to limit the disaster. Future values of even tangible products will relate to additional features: design has become a process rather than a definition of a form, has become a service rather than a function and its aesthetics lay in intangible values like dealing efficiently with multi-tasking activities and multi-channel communication.

From Structure to Content: Design Aesthetics and Post-Digital
With the belief that in the future we would need professionals able to extricate themselves in an increasingly complex, transformative, and above all cross disciplinary world, DIDI established a Curriculum as different programs to be combined obligatory by each student according to his/her inclinations. Out of four different concentrations (Product Design, Multimedia Design, Fashion Design, Strategic Design Management), they can freely choose which two to combine, with the ambition to define a community of designers with hybrid skills, able to interpret their time and create the jobs that don't exist yet. Ecology of Forms is a course part of the year one Foundation program, that focuses on the creative design process through acts of drawing (representing) and making (simulating) by using digital and analogue tools in an intertwined way. The workshop environment provides a laboratory experience to explore ideas related to form, space, materials, and systems through a series of iterative, task-based activities all connected to each other. The activities expose the participants to a unique

cross-section of design and media, which has the intention to reinforce the idea of multidisciplinarity with an emphasis on thinking through sensing and making, and making through sensing and thinking. In this fluid environment where digital and physical tools are working seamlessly, «the historical distinction between the digital and the non-digital becomes increasingly blurred» (Berry & Dieter, 2015): the Ecology of the title is the system of tools behind the different forms in which we can describe and manipulate objects (real or virtual) in a multi-channel experimentation. Scanning, physical modelling, rendering, additive manufacturing, digital photography, data-driven design, evolutionary design, image editing, vector drawing, video editing and video game, are explored, task by task, ending up in the final work where all is ideally combined, as part of the whole.

The main driver in designing the content of the course, has been the power of the process beyond vision and beyond media, pursuing a physio-digital aesthetics. The backbone of the course is the idea of a constant transformation, in the specific case, the transformation of a picture into a video game, to emphasize the fact that ideas and creativity are the result of many elaborations. In other words, to highlight that they are not something we have to wait for, but something we have to search for. Design is acting and the course wants to associate the creative process to the transformation of data: from source of inspiration to source of research. To achieve this goal, the work is organized in a series of specific tasks based on the result of the previous one, this to reinforce the correlation between them. The tasks are presented through a specific keyword, an imperative that synthesizes the main action to be executed: Filter, Cut, Blend, Sample, Loop, Record and Amplify. Although part of the objectives is to gain technical skills, the main aim is to spur exploration: it is about using tools designed for execution and control, to expand the imagination of the designer, and therefore it is not about designing a final object, but creating uncertain objects, "sketch objects", where the ambiguity facilitates reinterpretation, and can trigger new ideas.

Filter
The concept for this phase is based on the idea of filtering data, or in other words, selecting only a spectrum of information from the source material. To experience this idea, the task starts with the digital processing of bitmap images with a raster graphics software. The manipulated picture is a photograph taken by the students with a camera or a smartphone. The mutation of the picture with bitmap filters is done in a way that the original subject is barely recognizable.

The second part, "breeding", consists in the combination between different groups of pictures using different blending modes. In breeding the goal is to create greater opportunities for diversification among the mutation outcomes, and it is an introduction to the concepts of automation and algorithm as set of rules that are applied to perform a transformation. Flow chart diagrams are used to organize the breeding process. The criteria for the selection in both cases is based on diversity and mimicry.

Cut
Cut proposes another way to filter information from a source material. The idea is doing it through a precise action, a sharp tool. With this step, it is introduced the concept of vector graphics and the intervention on the previous bitmap occurs precisely in its conversion into a vector image. The conversion is a strategy to understand the picture as an ensemble of areas with colour consistency, cut if we want, from the original picture. From the new image, two shapes are selected and imported into a CAD software. The goal in this second phase is to intersect the two shapes orthogonally and scale them to make them coincident in their intersection line. The objective is to use these shapes as orthogonal sections as reference for a new three-dimensional object. The same shape combination is explored using different materials, from plywood to PVC, and cut with the appropriate tools, from exacto knifes to fret saws.

Blend
Blend is the phase where these shapes oriented in space become sections of a volumetric object. The exploration is moved to the physical realm and it consists in the construction of one of the infinite forms within the limits of its sections. It is about the interpolation between the sections, understanding their characteristics and how those are transferred to the surface of the object. To tackle this task, two divergent approaches are suggested: "the continuous" vs "the discreet". The first one is dealing with the act of forming, in particular it is suggested to use clay to sculpt the form, and XPS foam to carve it from a block. The second one is dealing with the concept of adding in a structured way similar volumetric modules, an excuse to tackle the concept of voxels and proliferation rules according to the chosen geometry.

Sample
Sample aims to understand how to describe an object and its characteristics, in between the physical and the digital, with the comprehension of topics like Laser scanning and Photogrammetry on one hand, Point Clouds, Mesh and Nurbs surfaces on the other. The models generated in the previous step, are taken and digitalized using different methods to experience different scanning procedures and qualities. With the objective to emphasize the pervasion and accessibility of these technologies, the scan process is comparing the result of a professional Laser Scanner with an accuracy up to 0.05 mm and 1.3 mpix texture resolution to Smart Phones equipped with Lidar technology or simply using them with photogrammetry software easily available on app stores.

Sampling the physical object is a procedure able to uncover novelty, if you are open to welcome deformations due to lack of information or misunderstandings in data collection. The technology is not simply used here to survey, to represent the object, but again the question is how this way of collecting data could be used as a creative tool. The final step of this phase consists in rendering the object using different materials,

testing alpha channels, transparency, texture mapping and depth mapping. The final goal is to reinvent a materiality to the physical object. A materiality that exists in the digital sphere.

Loop
The photogrammetric survey process explored in the previous step is here repeated as a simulation in the digital world. The animation generates a sequence of still frames that are synthesizing the geometry and the texture map as a bidimensional representation of the object itself. The pictures are then combined using open source panorama software, to stitch all the pictures together. The deformed 2D representation of the surface is then used in a black & white format as a displacement map to (re)generate a 3D object starting from a platonic solid.

Record
The object obtained in the previous phase is "recorded" into a physical format using additive manufacturing technologies. The information of the previous object has been already stored in a different format, a three-dimensional format, when the platonic solid has been deformed acting in the normal direction of the surface according to the light and dark areas of the map. Here that new geometrical information is transformed into a physical object.

Amplify
Inspired by works like "Everything", a video game designed by David Oreilly[1], the objects created/discovered during the different phases of the course, are now used in different forms and relationships to define the elements of a new system, from its environment to the characters acting in it. This step is kind of a synthesis of the entire course where there is again a transformation of models through different dimensions, from 2D drawings to 3D forms and 4D animations. Free-Body diagrams and Storyboards are used for a better comprehension of the dynamics of the system. With the first one, synthetic diagrams are used in one hand to picture the forces involved in the system and on the other to define the degree of liberty of the objects. The storyboard instead, focuses more in describing the action, showing what could be the narration occurring because of the specific dynamics of the system. This final exercise uses a video game engine to set up a model of the behaviour of the system, a fundamental experience to understand why we build them and how we abstract their components.

Form is the medium of transformation
»The Aesthetic response is about the perception of (un)attractiveness« (Jagtap & Jagtap 2015) of an object, and this has to do with its physical dimension and relationship with the human body. In other words, what we call Aesthetic is the comprehension of an object using our body and its senses. In an increasingly immaterial world, this physical dimension is not abandoned, but projected, transformed, in a way that we can perceive these feelings as they are coming from a tangible entity. This projection is actually amplifying our possibilities, expanding the outcomes to boundaries that we can difficultly imagine, and these sensorial qualities that we perceive with the aesthetic feeling, they can be used as a compass to orient and modify the design strategies. The degree of an object's capacity to surprise us, as designers in the design process, tends to correlate with its capacity of being transformative, the ability to be in between different realities. This is the Aesthetic of the design process. The technical tools we use, software and hardware, digital and analogue, are the triggers of this transformation. They are also at the base of the exploration, that - because of this seamless connection between the immaterial and the material - helps us to reach aesthetical spheres otherwise difficult to explore. We are asked to equip our future designers with tools that make them able to swim into this fluid system and also to be active in the process of re-combination of form, matter and meaning. Here form doesn't follow function, form is the medium of transformation. We must be able to observe and when needed, master the tools to manipulate the transformation by activating different forces. This research is just at the beginning and needs to continue this investigation on how this mixed media approach could shape the design process and its final outcome in terms of bodily qualities.

[1] For further information: http://www.davidoreilly.com/

References

> Antonelli P. (2011). *States of Design_04: Critical Design*. Retrieved July 10, 2020 from https://www.domusweb.it/it/design/2011/08/31/states-of-design-04-critical-design.html
> Bardzell, J. & Bardzell, S. (2013). What is Critical about Critical Design. *Paper presented at CHI*, Paris: ACM
> Baumeister, R.F., Vohs, K.D., DeWall, C.N. & Zhang, L. (2018). *How Emotion Shapes Behavior: Feedback, Anticipation, and Reflection, Rather Than Direct Causation*, Retrieved July 22, 2018 from http://journals.sagepub.com/doi/abs/10.1177/1088868307301033
> Berry, D.M., Dieter, M. (2015). *Postdigital Aesthetics: Art, Computation and Design*. London: Palgrave Macmillan.
> Dunne, A. (2008). *Hertzian Tales Electronic Products, Aesthetic Experience, and Critical Design*. Cambridge: MIT Press.
> Munari, B. (1971, repr. 1995). *Artist and Designer*. Bari: Laterza.
> Norman, D. (2005). *Emotional Design: Why We Love (or Hate) Everyday Things*, New York: Basic Books

> Poynor R. (2016). Critical World Building, interview with A. Dunne and F. Raby. In Coles A. (Ed.), *Design Fiction*, Berlin: Sternberg Press
> Revell T. (2013). Critical Design / Design Fiction lecture finally written up. Retrieved February 10, 2017 from http://blog.tobiasrevell.com/2013/12/critical-design-design-fiction-lecture.html
> Jagtap, S. & Jagtap, S. (2015). *Aesthetic Design Process: Descriptive Design Research and Ways Forward*. Retrieved July 12, 2020 from http://lup.lub.lu.se/search/ws/files/5845023/5435640.pdf
> Tonkinwise, C. (2005). Just Design – Being Dogmatic about Defining Speculative Critical Design Future Fiction, Retrieved July 22, 2018 from: https://www.academia.edu/15086757/Just_Design_Being_Dogmatic_about_Defining_Speculative_Critical_Design_Fiction_Futures
> Wood, W. (2000). Attitude Change: Persuasion and Social Influence. In *Annual Review of Psychology*. *51*. 539–570, Retrieved July 22, 2018 from https://www.annualreviews.org/doi/10.1146/annurev.psych.51.1.539

The places of training

Today's educational challenge, venturing into contemporary methodologies and new digital technologies, seeks to design new spaces for the exchange and transmission of new knowledge. The places of contemporary training, interpret spaces by modelling themselves in relation to learning paths and differentiating between specialised training and applied training, between transmission of knowledge and dissemination of knowledge.

The organisation of the spaces follows the contemporary educational approach, that is, respect for learning with one's own cultural and scientific interests.

Outside of institutional training, companies, starting from the first half of the twentieth century, began to realise the fundamental role of training in industrial production. The Academies were born from this need. They represent a new concept in training: a physical and virtual place, aimed at continuous production and sharing, in order to create added value for companies.

The sharing of experiences also emerges in the "Laboratories of Making" (Laboratori del Fare), the so-called Fab Labs, which exchange methodologies and related tools, strictly linked to the technological dimension.

The laboratories, connected to the network, discuss the best solutions in the field of technology, design and teaching, all designed from an open source perspective.

Museums and historical places made for the conservation and the dissemination of knowledge, have also been transformed into new places for training.

The museum has now become a Science Center, a place of dissemination and contemporary learning, where the user is formed through an experiential approach, abandoning the iconic and didactic representation to illustrate scientific theories through experiments and installations of augmented and interactive reality. It is a cross-section that looks to the future, in search of a teaching model based not only on technological innovation, but also and above all on the experiential approach and on the organisation of physical space.

Davide Paciotti

[experiential training, science center, academy]

Pop up installation exposition 999, questions on contemporary living, Laps architecture - Marco Imperadori
Politecnico di Milano, Triennale di Milano

01

Design of spaces to support teaching methods

>
The design of the teaching environments helps to support the pedagogical methods of teaching and offers, to both teachers and students, the opportunity to work in contexts that are consistent with the forms of learning.

02

03

04

01 *Vittra School Södermalm*, Rosan Bosch Studio, Stockholm, Sweden, 2012.
02 *Ørestad College*, 3XN, Copenhagen Municipality and the Danish University and Property Agency, 2007.
03 *IBOBI International Kindergarten*, VMDPE Design, Jingshan Villa, Shekou, Nanshan District, Shenzhen, China, 2016.
04 *Waalsdorp Montessori School*, De Zwarte Hond, The Hague (The Hague), The Netherlands, 2014. Photo: ScagliolaBrakkee.

01

Coworking and academy: specialist training paths

>
The spaces dedicated to co-working are implemented by specific training courses through the academies, which provide fundamental digital skills for the job market.

02

03
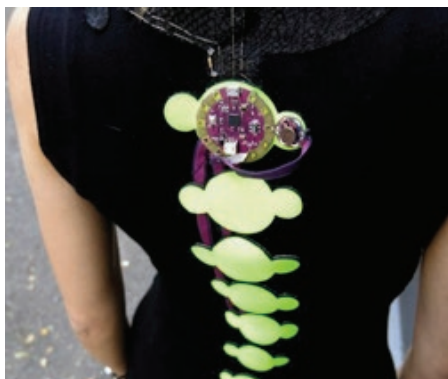
04

05
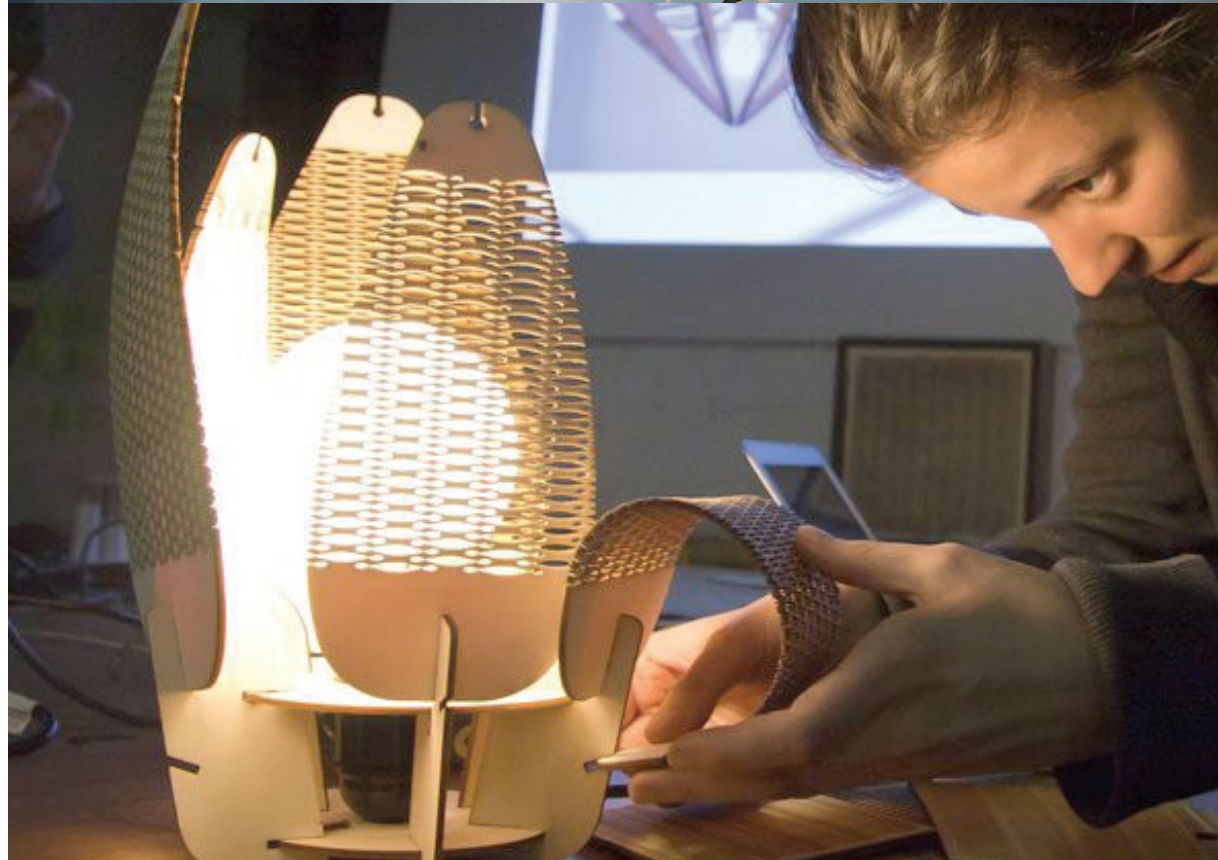
06

01 *Talent Garden*, the largest networking and training platform in Europe for digital innovation, 2014.
02 *Talent Garden Vienna*, Liechtensteinstraße, Wien, Austria, 2019.
03 *Build Space*, Autodesk Academy, Boston, 2016.
04 *Digital Design & Making-Wearables Pro*, outcome of the Fastweb Academy course, in collaboration with WeMake, Milan, 2019.
05 *Technology center*, Autodesk Academy, space dedicated to cobot training, 2017, Boston. 06 Digital Design & Making-Design for digital fabrication, outcome of the Fastweb Academy course, 2019.

Focus gallery

01

**Learning by doing:
the laboratory spaces to learn**
>
The making laboratories trigger
changes that see open source
and technological know-how as
opportunities for growth in training,
design and production.

02

03

01 *OpenDot*, Fab Lab, research and open innovation hub, Dotdotdot, Milan, 2014.
02 *Fab Academy*, digital manufacturing course of the worldwide network of Fab Labs, from 2009 to today.
03 *Physical Possibility*, School for Poetic Computation, Chris Anderson, 2015
04 *Engraving on silence*, Pier Alfeo, in collaboration with the Open Source School of Bari, 2018. 05 Circular
Future Kit, Dotdotdot Eni + School project, 2019.

Focus gallery

04

05

01

02

03

04

From the museum to the science center: interactive learning
>
In the Science Center model, the museum abandons the historical tradition and the display of collections, to present pure scientific principles through the creation of interactive displays.
image captions

05

06

01 Tipoteca, museum-archive-library-printing-gallery-didactic laboratories, Cornuda, Italy, 1995.
02 La Maison de la Vache Qui Rit, atelier-ZOU, Lons-le-Saunier, France, 2018.
03 Origami: the bow ties. Workshop activities inside the La Maison de la Vache Qui Rit museum.
04 Typography course, workshop activities within the Tipoteca museum.
05 "All About Me", National Children's Museum, At Large Design- Eureka !, Halifax, United Kingdom, 2013.
06 Corporea, Science Center, City of Science, Naples.