Material Designers

Boosting talent towards circular economies

MaDe (Material Designers) is a project, co-funded by Creative Europe Programme of The European Union, which aims at boosting talents towards circular economies across Europe. MaDe is a platform, a training program, an award and an event series showcasing and demonstrating the positive impact Material Designers can have across all industry and on the generation of an alternative creative industry aiming at circular economies.

Material Designers are agents of change. They can design, redesign, reform, reuse and redefine materials giving them an entirely new purpose. Increasing the potential of materials, they can go on to research, advise, educate and communicate what materials are and can be in the immediate, near and far future, implementing positive social, economic, political and environmental change across all sectors towards a responsibly designed future.

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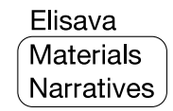

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Circular Material Fundamentals

Material Designers Toolkit

Circular Material Fundamentals

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Material Education: New Training, New Skills

Words by
Valentina Rognoli
Ziyu Zhou

1.3

With the evolution of technology today and designers' continuous exploration and interpretation, the material world is undergoing tremendous changes. The investigation and exploration on new materials and their unique characteristics have caught attention of not only designers but also design educators. This chapter shows how current material education evolves to enable design students to create a conscious dialogue with materials, especially considering the material as designable to achieve circular design by focusing on their "personalities": their experiential attributes. The chapter contains three parts: a brief review of relevant literatures on design and material education, a desk research on the changing material world as new context of material education, as well as a summary of material education in design based on existing educational phenomena and its future prospects.

02 A REVIEW OF THE PAST

Materials have always been considered as one of the essential elements in design practice and design education. The first Bauhaus Design School, had a dynamic and growing educational approach, constant improvement to the professors' teaching curriculum (Cross, 1983) and the consideration of one's own sensations and expressions as its principal foundation (Itten, 1963)., with the consideration of one's own sensations and expressions as the foundation (Itten, 1963). There, materials and processes were highlighted as vital components of the education approach with one of the principal aims: to encourage students to understand basic and specific material characteristics (Wick, 2000) and explore primary material perceptions based on hands-on exploration (Rognoli & Levi, 2004). Influenced by Dewey's philosophy of epistemology, the following New Bauhaus in Chicago constructed the practice-based knowledge generation within the courses (Moholy-Nagy, 1947; Fiedler & Feierabend, 1999). It had a clear purpose: offer "a test of students' abilities, ...[to help] shorten the road of self-experience, ...[and] give [the students] ample opportunities to make a careful choice of his field of specialisation later" (Educational Program, 1937-38). Students were asked to define and explore two general types of practice with materials and tools to achieve hands-on learning and effective participation in order to gain more skills in design. First type of exercise presumed to explore one specific plastic element in different media, such as testing and experiencing the potentialities of texture through drawing, printing, photography, hands-on working in various materials. The second type was to reserve the first process to explore the expressive potentialities of plastic elements with only one kind of material and tool. The final exercise addressed exploring the medium's capacity to object, combining its artistic type, without any restriction of a specific function. Moholy-Nagy considered that the main objectives of this kind of exercise were to build their self-consciousness and get rid of their fear when facing up to design issues (Moholy-Nagy, 1947). Following Findeli (1990), this practical-based educational model on materials enables students to experience a progression leading from an unconscious state to full awareness and leading them to the eventual mastery of design. It can prove the role as a medium can get materials in design education, and also enlightened modern design pedagogies to consider material competence and hands-on practical ability as two of the essential aspects.

Then, with the development of the industrial revolution, design education was integrated with more industrial knowledge and skills from engineering scope, especially in materials' aspect. In order to enable growing designers to make proper decisions on material selection, material education is gradually characterized by a curriculum with a predominant focus on materials' technical properties. These kinds of courses became common and basic in design education in different sections such as product, fashion, textile, interior. etc., to teach physical properties of various materials and their behaviors in product manufacturing and use, to minimize cost while meeting product performance goals (Dieter 1997; Ashby 1999). Besides, the industrial approaches on teaching and learning also contain learning by doing activities to enhance students' materials and manufacturing aptitude. Many researches have given the hints that designers can get their materials knowledge augmentation through creating design prototypes and mock-ups (van Kesteren, 2008; Pedgley, 1999). As a convention, almost all of the design students have the experience of creating physical models in end materials to test out the suitability of new or newly applied materials to a developing design concept. This is an effective approach to evaluate whether a material can meet the design requirements, or to explore the feasibility and effectiveness of unknown new materials, and sometimes this is the only way (Pedgley 2010). The competencies of selecting materials in accordance to their properties and processing has already became one of the prerequisites of designers today.

However, even if the material education discipline has used and adapted some resources developed from the engineering field, it also created its own approaches over time. As early as 1986, Ezio Manzini had a discussion on the abundance of new materials that has caused a shift in the relationship that people once had with materials (Manzini, 1986). Gradually, designers' concern for materials and manufacturing selection is motivated not only by achieving utility but also to leave a more general positive impression on people (Christensen, 1992; Sweet, 1999): in designers' eyes, materials became "Multi-dimensional", such as the engineering dimension (the technical properties), the usability of ergonomics and interfaces, the environmental issue considering sustainability, the expressive-sensory dimension and the material "personality" (Ashby & Johnson, 2003). So far, although the material selection was still the major topic in material education, the principles of selection have become increasingly rich and complete. With the term of the "materials experience" generated (Karana et al. 2015), many material-based design tools were invented to lead designers understand and explore materials' experiential attributes, such as the Material Perception Tools (van Kesteren, 2008), Meaning Driven Materials Selection (Karana, 2009), Expressive-Sensorial Atlas (Rognoli, 2010) and Material Aesthetic Database (Zuo, 2010). These sources are introduced to design students as well, to support them to understand the building blocks of materials experience from sensorial, interpretative (meanings), affective (emotions), and performative levels, and to have a more concrete grounding for articulating 'experiential' material requirements and constraints alongside the technical (Pedgley 2014). Based on this, Material Driven Design method had been developed to facilitate design processes in which materials are the main driver (Karana et.al. 2015). Designers are encouraged to apply the MDD method either to design based on a fully developed material sample or the semi-developed or exploratory samples, such as food waste composites, living materials made of bacterial cells, 3D printed textiles, flexible OLEDs, etc. Some emerging design courses with their pedagogies translated from MDD method such as Designing Materials Experiences in Polimi, or Material Driven Design in Tu Delft, have enabled more material-driven exploration and innovation to emerge in design schools. Therefore, a transition had appeared and developed in material education of design these days: students are encouraged to actively explore materials and consider material as a starting point of a design process. They are attempting to place this essential element of the design process, the material, in a privileged position.

03 THE CHANGING MATERIAL WORLD: NEW CONTEXTS

The education of materials in design has always been influenced by changes in the external world. Today's design education focuses on materials is trying to keep up with the real needs of designers, in response of the changing and evolving world with many requirements and issues. More than ever, designers need to be able to capture the subtle changes in the world we live in; this requires them not only to have inquiring minds and to work hard but also to have a strong social responsibility. From continuous exploration, innovation and communication, designer's focus and interest in materials is changing and evolving tremendously nowadays. They began to create their own languages on materials such as new material typologies, new fabrication processes, new consideration on relations between users and products. Many novel material sections generated, like Growing materials (Collet, 2017; Camere et.al, 2017); Interactive Connected and Smart (ICS) materials (Rognoli et.al, 2017; Parisi et.al. 2018), Social materials (Drazin & Küchler, 2015), Transmaterials (Brownell, 2017) revealed the diversity of material innovation, also showing that designers and design researchers are aware of how these material innovations and related practices can facilitate the development of design discipline into more transdisciplinary. This brings an enormous changing and developing of the design world. Besides, we are facing up to new challenges as today's designers because of the potential crisis we might have in the near or far future: waste of food, energy and other resources; over polluted water and solid; over emissions during manufacturing processes... Back to the theme of circular design, material consideration is essential, and designers can be able to actively propose new material solutions to get a more sustainable results by manipulate the materials and its circular systems. The ninth principle of Dieter Rams says that good design is environmentally friendly and sustainable (Rams, 2017). From the point of view of material design, we can firstly interpret it as a flow of highly efficient material resources and low recycling emissions and production costs, but the circular choice of materials also affects the immateriality of the design: the social and economic impacts and the value of the user experience while using the product. Under this new context, designers need to have new dialogue competences with materials and make better material decisions.

In design education, the cultivation of the capabilities on dialoguing with materials has become more flexible and challenging. Designers' material competencies must not only follow technological updates but also require them to keep their social responsibility in mind, in order to respond to the material sustainability issues today actively. It is necessary to put materials in a role that can be designed and explored, to allow design students to conduct multi-dimensional explorations and dialoguing with materials' environmental, economic, cultural, and technological, etc. aspects. Ziyu Zhou's ongoing doctoral research is trying to reveal a future landscape of materials education in design and define a feasible pedagogical framework taking materials as a designable element at the starting point of the design path (Zhou, 2020). The research aims to construct a method to enhance design students' ability from two fundamental aspects of material education: thinking and practicing. Many elements that can be considered and used to create tools or approaches for material exploration among the framework, and as well, they are usually be regarded as intentioned learning outcomes in today's materials education in design, such as:

(a) Keep updated and understand the emerging materials and technologies;

(b) Criticize and investigate the resources, materials flows and the circular issues we are facing up today;

(c) Explore the material processing technology and approaches, to give material new properties and attributes;

(d) Analyze and rethink about the relationships between people, objects and materials, based on understanding and exploring the material experiences.

By studying the current technology and market development state, several highlighted trends can play a vital role in the future development of materials education. First of all, the democratization of personal fabrication can break down the barriers of design and manufacturing, allowing designers to understand and manipulate materials directly. This will pin down the concept of "materials" in design, turning it from the parameters written on the paper into touchable auxiliary design tools. Therefore, the popularity of Fab Labs may gradually change the design educational patterns, and it will also change the basic approach of material cognition by design students. Moreover, the increasing number of material libraries nowadays provides massive tangible resources for the current design and material education. The material libraries have established a direct link between market resources and education, and its own existence as a design consult business also allows design students to see the potentiality from large amounts of material suppliers on the market. Besides, a considerable number of open educational resources have also made material learning more comfortable and more autonomous. Designers today can use the availability of information properly to explore material stories and experiences into more circular and more sustainable and increase the impact of materials as an entity that can be designed. Besides, people can share a common design language on a global scale in our digital age.

External developments and new trends incubated the changing perspectives on materials. In recent years, design students have shown increasing curiosity about designing and transforming materials' experiential attributes, which explains the large number of hands-on courses that take "materials" as a starting point for the generated design path. New teaching attempts, such as introducing DIY-Materials practice (Rognoli et al. 2015) to students and encouraging them to explore and create new material experiences by a hands-on approach, have received very positive feedback because they allow a more engaging and active dialogue with materials.

04 CONCLUSION

As the designers' perspectives on the material gradually changed from technical properties to materials experience, emerging educational activities began to conceptualize and contextualize the materials experiential attributes and integrate it into the design education. A phenomenon generated recently is catching people's attention: the pedagogy in material education tends to engage students taking "materials" as an active entity to be designed, rather than just a passive thing to choose in the design path. This has led us to reflect on the future of materials education in design: do we need new training methods to guide designers to dialogue with materials? Do contemporary designers need new material skills to adapt to this fast-changing world?

Started from the generic view on the material in the design world, and expanding to detailed branches such as material selection or materials experience, the literature on the material aspect of design can reveal how the designer's perspective on materials gradually changes in these years. Besides the material selection in design, quite a few designers have begun to put materials at the beginning of their design paths, exploring the infinite potential they can offer. Opinions of design scholars, material specialists, and material designers show how the evolution of the material world inspired designers to new circular solutions and ecodesign to look differently at relations between humans, objects, materials and systems. Reflecting on what has happened in the past to the present day, as well as anticipation following today's new context, the chapter aims to encourage us rethinking the evolving role of materials education in design for a circular and more sustainable approach.

There is still a long way to go for materials education in design, and it struggled to adapt to the current development and trends of science, technology and social forms. Putting materials in a position where they can be designed and explored will undoubtedly have a revolutionary impact shortly, and also heralds that materials will continue to be one of the crucial considerations in the future development of design education. Thanks to design material educators, scholars and experts for their continuous explorations and teaching practices, in the future design field, there will be more and more material professional figures who can connect design aesthetics and manufacture directly. Just like sommeliers, they can have their unique methods and tools to "taste" and feel materials, and be able to analyze, evaluate, advocate, and even create new ones. They will play an essential role in building a sustainable future.

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Materials Designers: A New Design Discipline

Words by
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The history of the relationship between human beings, materials and technique is long and complicated but fascinating. It has always been addressed with a multi-disciplinary approach, thanks to various and relevant studies belonging to multiple fields of research. This relationship, since the mid-nineteenth century, has been inscribed in the field of industrial design, and it is transformed to an inseparable and consolidated connection between the designer, the materials and the techniques, capable of responding to the needs and requirements dictated by contexts and times.

Today, human beings are experiencing an era characterized by the need for a more responsible role for design in environmental, technological and social issues. It seems that new profiles of designers who are more aware and able to embody their work with the coming and future concerns, seem to be emerging. Scholars have always investigated the role of the designer, still questioning the foundations of a profession that only initially seemed to be exclusively dedicated to giving an aesthetic form to artefacts. Nowaday, in modern societies, the designer has become significant creator of meaning in everyday life (Grant & Fox,1992) with the growing responsibility of the product as a whole, starting from the material choices up to the considerations relating to the overall environmental impact (Thackara, 2006; Papanek, 1972). The urgent need to consider the specificities of respect for the environment in every artefact that is created is increasingly evident. It is no longer possible to wait or ignore the problems created by human beings to the environment in which they live.

Within the design culture, the idea is now ripe that it is always necessary to design inside the confines of design for sustainability practice. As Stengall stated in 2006, the role of the designer in developing a sustainable society is not merely to create "sustainable products," but rather to envision products, processes, and services that encourage widespread sustainable behaviour. This goal of designing for sustainability can be accomplished through the development of a new philosophy to help guide design decisions. Furthermore, it is necessary to take into consideration that every artefact is a form of persuasive communication in which it serves as an argument for how people should live because with every new artefact designers have directly influenced the actions of individuals and communities, changed attitudes and values, and shaped society in surprisingly fundamental ways (Buchanan, 1989).

Moving forward, you can also understand that to design for sustainability requires not only the redesign of human habits, lifestyles, and practices but also the way humans think about design (Wahl & Baxter, 2008). Vezzoli (2003) stated that designers have an essential role to play because they form a bridge between the consumer's cultural sphere and the world of production. Designers also need to become aware of their new responsibilities and their specific contribution in the transition towards a sustainable society.

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