Concerning Apples & Oysters

Middelkoop, Catelijne van; Pescatore Frisk, Ryan

DOI
10.1201/9781003491484-15

Publication date
2024

Document Version
Final published version

Published in
Applied Design Research in Living Labs and Other Experimental Learning and Innovation Environments

Catelijne van Middelkoop,
Ryan Pescatore Frisk

12. Concerning Apples & Oysters

DOI: 10.1201/9781003491484-15

Introduction

By far, the best place to train people for practice is in practice (Lawson & Dorst, 2009). The depth and nuance of knowledge imparted by practice-based learning are significant. However, even under ideal conditions, aspects central to the professional design field cannot be replicated in formalised design education. This chapter embarks on an in-depth examination of design education paradigms in the Netherlands, scrutinising the nuanced interplay between theory and practice. The discussion begins within the historical backdrop of art and crafts education, tracing its origins from the guild system's decline to the contemporary challenges faced by creative vocational schools, art academies, and universities. A thorough exploration of educational differences, contextual separations, and the historical evolution of design disciplines sets the stage. The focus narrows onto *Transition Atelier The Last Makers*, a Living Lab embodying a real-world environment for interdisciplinary collaboration and innovative experimentation. As the chapter proceeds, it seeks to unravel the complex relationship between educational levels, bridge gaps in knowledge transfer, and challenge existing paradigms in design education.

Educational Differences

In the Netherlands, design programs are offered at specialised vocational schools (*vakscholen*) and Regional Education Centers (ROCs) in secondary vocational education (mbo), at universities of applied science and art academies (*kunstacademies*) in higher vocational education (hbo), and in scientific education (wo) at general and technical universities. Once a student obtains a secondary school diploma, those who wish to continue their education in the design field have many options to consider. However, not all design programs are equally accessible. Differences between institutions and developmental paths can limit individual potential and hinder social and cultural progress on a larger scale.

One primary influence is reflected in processes of rationalisation, which was increasingly present in the programs of technical schools (Prak, 1979), restricting the learning trajectory exclusively to students possessing a secondary education with an emphasis on science subjects (*exacte vakken*) and fundamental truths, which

other institutional levels do not expressly teach. MaxWeber connects rationalisation to bureaucracy, exemplified by the production of social stratification as impersonal, rational processes of social order (Ritzer, 2007). 'Weber is clear that what distinguishes the educated class is its very education and its desire to seek power through this' (Rao & Singh, 2018). 'In line with rationality, bureaucratization was developed to proficiently manage organisations—however, bureaucratization's segmentation and de-personalisation of the work process negatively impact worker's autonomy and creativity. Credentialism, which helps advance bureaucratization, created a system of social closure where only individuals with specific education credentials obtain positions in organisations' (Wui & Leviste, 2023). From this perspective, it is easy to understand how educational stratification reinforces a disconnection and hierarchy of knowledge types.

As a result, people have often regarded design and research as separate endeavours – the former residing in industrial practice and craft, the latter in academic experiments and reflection (Stappers & Giaccardi, 2014). Despite their differences, most settings that offer design programs still share one common characteristic: the physical spaces dedicated to making, which we will refer to as *workshops* for now. The idea of the workshop is used to transcend normative feature comparisons and classifications and instead explore unseen connections, relations, conflicts, and diverse knowledges.

Comparing Fruits

How can we compare the apples and oranges in front of us? Delving into the intriguing mind of taxonomist John Ray, one cannot help pondering his motivation when, in 1670, he added, 'As like an apple to an oyster' to the section Proverbial Similes in his *Handbook of Proverbs* (Ray, 1670). The evolution of this metaphor of dissimilarity over time and in different contexts, transforming oysters into oranges and giving rise to entirely new and unexpected comparisons like 'grandmothers and toads', adds a layer of curiosity to Ray's original intent.

While categorising these specific biological organisms may prompt contemplation, hierarchy is not the sole organising principle at play. At least not in design. The practice in taxonomy, the science of classifying and naming organisms based on shared characteristics. Just like the use of idioms, expressions with figurative meanings that cannot be understood by interpreting their individual words; canons in art history, sets of authoritative works, texts, and principles that are widely accepted as genuine and fundamental; tautologies in math, statements that are always true, regardless of the truth values of their individual components; typologies in things, systematic classifications or categorizations of entities based on shared characteristics; and principles in design, fundamental truths, guidelines, and rules that serve as a foundation for beliefs, actions, or reasoning, all play a pivotal role in creating and fostering understanding amongst groups of otherwise divergent individuals with a variety of skills and knowledges.

Common Roots

In the Netherlands, where making has not yet moved to the core of education (Lehmann, 2020), the roots of art and crafts education trace back to the decline of the guild system, a pre-industrial network of associations involving skilled artisans, craftspeople, and merchants (Prak, 1979). Most contemporary design disciplines originated from this craft-based tradition of creating tangible products (Lawson & Dorst, 2009).

Initially, guilds and crafts were in opposition, with guilds organising independent professionals and crafts forming distinct groups. Craft was the common term for the local trade organisation of individuals engaged in the same (economic) activity, such as weaving (weavers) and tanning (tanners). Drapers and cloth merchants, on the other hand, were members of guilds. Cloth merchants, for example, were traders who sold the cloth but did not manufacture it themselves (Haemers, 2016). Until their abolition in 1798 (Simon Thomas, 2008), the guilds aimed to protect members' interests, uphold craftsmanship standards, and regulate competition. Becoming a skilled craftsperson, such as a cobbler or weaver, typically involved a 3- to 5-year apprenticeship under a master, emphasising practical, on-the-job learning by doing (Lawson & Dorst, 2009).

Over time, guilds evolved from regulating professional conditions to establishing monopolies, influencing social and economic structures. Despite exclusivity, applied skill outcomes had no inherent social difference (Prak, 1979). Stonemasons, not architects, historically led building construction, and blacksmiths and carpenters crafted products, not industrial designers (Lawson & Dorst, 2009).

Crafting furniture, chalices, altarpieces, or statues was considered manual labour, holding equal standing or, later, equal disregard. These activities were categorised as mechanical arts (*artes mechanicae*), learned in workshops and serving practical needs. Which stood in contrast to the liberal arts like geometry and astronomy, taught at universities, primarily fulfilling intellectual needs, and more akin to what is now referred to as science or knowledge (Prak, 1979).

Contextual Separation

During the Renaissance, the work of the mind continued to enjoy a far greater prestige than work done by hand, at least in most disciplines. For painting, sculpture, and architecture, this status changed due to exceptional achievements by artists such as Da Vinci, Donatello, Michelangelo, and Raphael, as well as architect Brunelleschi, who invented linear perspective in the early 1400s and contributed to the evolution of the science of seeing, influencing the dominance of the visual arts. Acknowledging painting, sculpture, and architecture as liberal arts marked the onset of the dichotomy between fine and applied art. Scholars introduced the term *academy* in connection with Plato's school for higher learning. Despite fine artists' daily activities only loosely aligning with Plato's academic vision, they embraced the term, continuing to apply manual skills in established workshops (Prak, 1979), emphasising the concept of *thinking with their hands*.

This contextual separation persisted with the establishment of the Accademia delle Arti del Disegno in 1563 by Giorgio Vasari, which provided a theoretical supplement to the regular workshop training of emerging artists (Pevsner, 1940). Drawing was fundamental to all fine arts, with dedicated space for theoretical

and practical drawing classes. While theoretical boundaries were transcended on a conceptual level, practical workshops of applied artists outside the academy maintained a disengagement between different disciplines and between thinking and doing.

Co-creating Quality

In the entrepreneurial environment surrounding guilds and academies, merchants gained control over raw material supply, allowing a single tradesperson to hire multiple weavers who were put to work in independent workshops and deviating from guild wage standards. Conversely, royal businesses established by the French court granted privileges to hired workers, exempting them from guild obligations, with products avoiding quotas. Staff at these royal manufacturers were trained internally, sometimes with contributions from foreign workers bringing innovative techniques. Commissioned artists collaborated on fabric, tapestry, and furniture design alongside their independent work (Prak, 1979).

This artistic practice continues in the Netherlands today, exemplified by Royal (*Koninklijke*) Tichelaar in Makkum and the Vlisco Group in Helmond. Royal Tichelaar, initially a stone factory, now actively collaborates with artists in residence, external designers, and architects. They leverage their extensive knowledge in ceramics and glazes to co-create innovative products, including ceramic skins on building facades (De Vries, 2010).

A similar co-creation process unfolds at the Vlisco Group in Helmond, which has been known for high-quality printed fabrics since 1846. The invention of roller printing made the process less labour-intensive and more efficient than traditional manual methods. Vlisco emphasises the design process, granting commissioned artists ample time for intricate patterns. For instance, artist and designer Michiel Schuurman spent over a year developing a pattern inspired by light-emitting neons together with Vlisco's technicians. According to the website It's Nice That, the work is 'A huge feat considering the design totally disrupts traditional light-on-dark printing conventions' (It's Nice That, 2016). Both contexts highlight the importance of advanced internal communication in bridging the gap between design and execution, ensuring consistent production quality.

Upscaling Taste

A larger scale and more advanced division of labour, with designers working alongside producers, such as the highly skilled technicians still working at Tichelaar and Vlisco today, provided independent companies a significant economic advantage over typical small workshops of guild members. This systemic approach to and partial centralization of production gave the French an artistic advantage over other countries, which they maintained from the 17th to the mid-19th century and showcased in an increasing number of intricately illustrated books. These books allowed craftspeople and ordinary people elsewhere to follow and even acquire French taste. This ambition fed into the desire of well-to-do Dutch who, at that time, preferred to obtain artistic, well-made consumer goods from abroad that were generally considered more appealing than those of Dutch manufacturers (Simon Thomas, 2008). As society continued to industrialise and prosperity increased, a desire to participate in the 'culture of their time' also grew among the middle class elsewhere in Europe. With a booming demand for decorative arts products, national governments and city administrations throughout the continent wanted to limit imports and promote exports. One way to achieve this was through the quality of design (Prak, 1979).

In many places, this resulted in a desire to elevate the level of local manufacturing through better training of both personnel and entrepreneurs. This subsequent focus on educating craftspeople was part of a growing demand for knowledge. Sometimes, separate schools were established for this purpose. Similar to the Accademia delle Artidel Disegno, the education provided by these arts and crafts programs supplemented workshop training and included drawing from examples, plaster, and live models, and often some theoretical instruction in linear drawing and perspective. Practical training was not seen as necessary, as it was already provided in workshops and at manufacturers, reinforcing the gap between design and execution (Prak, 1979).

Sweeping social changes occurred due to the Industrial Revolution, even though industrialisation and modernisation took place more slowly in the Netherlands than elsewhere in Europe (Simon Thomas, 2008). From mechanical inventions to innovative approaches to traditional practices, the most unique was the merger of technology with industry. No doubt impressed by the

French Industrial Exposition in 1844, Henry Cole, one of the editors of the *Journal of Design and Manufactures*, which encouraged artists to apply their designs to everyday articles that could then be mass-produced and sold to the great 'unwashed', convinced the British Prince Albert, husband of Queen Elizabeth, to organise a *Great Exhibition* (Prak, 1979). Where the journal aimed to improve the standards of British industry and provided the middle-class audience with instructions on taste (Coleman, 2001), the exhibition offered an unprecedented chance for all nations to display their best work and compare it with the production quality of other countries.

Humbling Experience

The result of this immense bazaar was, as far as applied or industrial art goes, depressing everywhere (Pevsner, 1940). In particular, the 'tasteful appearance' of what was presented 'left much to be desired' (Van Voorst tot Voorst, 1980). the Netherlands was not at all prepared for such competition. However, it was not the stagnant industry but rather the lack of interest by the Dutch government that was the chief reason for the sparse representation. Compared to other countries, the Netherlands did not consider an excellent international display of its national industry to become a government matter (Simon Thomas, 2008).

Embarrassed (and aware of a missed economic opportunity), the Department of Education, Arts, and Sciences strongly advocated for the establishment of Dutch art academies and schools of applied arts (*kunstnijverheidsscholen*) to improve the quality of applied and industrial arts in the Netherlands. However, because the results of teaching tasteful appearance were not as easily measurable as those coming out of trade schools or technical schools and precise positioning of applied art products in a broader societal context was lacking (compared to, for example, graphic arts in Switzerland or furniture, glass, and ceramics in Sweden), the schools were heavily constrained in their resources during the pre-war crisis years (Prak, 1979). The modest financial resources of the applied arts schools limited their technical capabilities and, consequently, their curriculum. For example, glass was decorated but not blown because the schools needed an oven and blower.

Still, there was a demand for experts. Once again, companies took the initiative to train skilled workers themselves. For example, the glass factory in Leerdam established its own glass school in 1940, and it worked with teachers who occasionally also had teaching positions at applied art schools (Prak, 1979). Sometimes, this resulted in cross-pollination between what happened within workshops at both locations.

The introduction of small melting furnaces democratised glass design and manufacturing, enabling artists to work independently in their own studios. As a glass designer and teacher, Sybren Valkema (1916-1991) recognized this potential at the first American Craft Council (ACC) congress in New York. Following the closure of the Leerdam Glass School, Valkema aimed to integrate studio glass into the curriculum of the IvKNO in Amsterdam. In 1969, he founded the Glass Working Group at the Gerrit Rietveld Academie, emphasising artists' control over the entire glass-making process. Valkema's efforts ensured that studio glass became integral to the academy's curriculum and gained broader acceptance in the Netherlands (Meihuizen, 2009).

Future Practitioners

Another example of an educational program rooted in the outside world can be found at SintLucas in Boxtel, a secondary vocational school that originated from professional demand for future practitioners to strengthen a specialist workforce. Here, members of the union of Dutch painting patrons were searching for the 'Catholic painter patrons of the near future' who would be educated at the first Dutch Catholic School for Painters: St. Lucas. Seen as one of three pillars by the inspector of industrial education (*nijverheidsonderwijs*), ir. G. Slot, who performed the official opening in 1948, this school for painters (*schildersschool*) distinguished itself from the National Painting School in Utrecht by being the first to renew the training system and to convert the winter school into a day school (Nieuwsblad van het Zuiden, 1960). Prior to the foundation of the National Painting School in 1922, there was no specialised training for decorative painters in the Netherlands. Technical vocational education took place in trade schools. At the same time, private, more specialised institutions were established in certain locations to meet the demand for specialists in, for example, faux wood and marble painting (Simon Thomas, 1998).

The program's initial focus on applying paint as protection and finishing was tied to the housing industry and, over time, evolved into a specialised curriculum for aspiring restoration and decoration painters. A growing interest in creativity and aesthetics since the late 1960s influenced a demand for additional courses in commercial art such as advertising (*reclame*), showcase design (*etaleren*), and presentation techniques (SintLucas, 2023). At this time, the curricula of most art schools in the Netherlands moved away from traditional arts and crafts education (Van den Eijnde, 2015) to make room for other approaches. Today, the original restoration and decoration painting program at SintLucas coexists with other programs designed in response to new tools, emerging technologies, and ongoing developments within and demands from professional practice.

This integration of traditional (arts and) crafts and emerging technologies can also be seen at two other creative secondary vocational schools: Cibap in Zwolle and HMC (Wood and Furniture College) in Amsterdam. In response to signals that many studio occupations (*atelierberoepen*) were in danger of disappearing (Consortium Creatief Vakman, 2017), all three schools offer programs in creative craftsmanship (*creatief vakman*) where students are trained in a chosen specialisation such as wood, textile, leather, ceramics, and glass. Although students learn in traditional workshop settings, the program focuses on developing contemporary craftsmanship by incorporating innovative techniques and creative design principles into the curriculum. Students are challenged to work with materials and techniques that are new to them (Consortium Creatief Vakman, 2017), and which could help to position themselves as perspective designer-makers (*zelfproducerende ontwerpers*) in broader and interconnected contexts, on one's own initiative (Huygen, 1984) yet in co-creation with others.

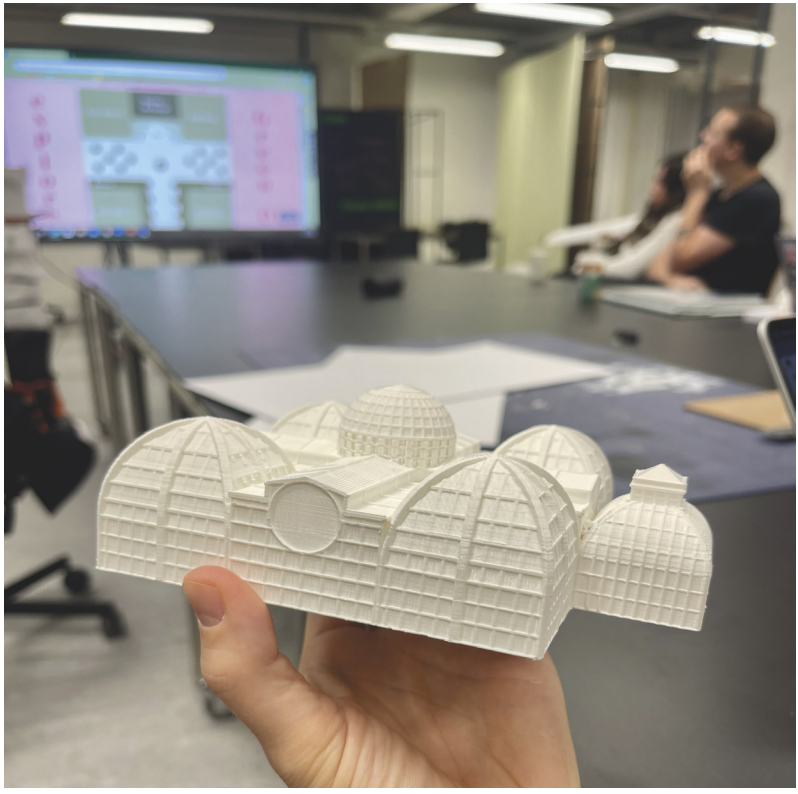

Figure 1. Green Oasis, the rough 3D printed model used for discussion, represents an externalisation of cognition to facilitate knowledge sharing and development in co-creation. (Produced by students in the Context and Situatedness program at the Willem de Kooning Academy in Rotterdam, 2023.)

Contemporary Resonance

Educational workshops, experimental learning environments, and innovation hubs can play a significant role in formal education, professional development, community engagement, and skill-building initiatives. The skills taught in these workshops depend on the context and the reason for their teaching. For instance, there are only a few places in formal Dutch continued education where specific crafts, such as stained glass or restoration painting, are taught. Thus, the sounds of a glass cutter scoring a pattern, sandpaper smoothening a surface, or a palette knife working pigments and medium into a smooth mix might be rare; however, the whirring sound of motors spinning in 3D printers can commonly be heard in workshops at all three levels of Dutch design education.

Although rapid prototyping techniques, such as laser cutting and 3D printing, have replaced some manual labour and brought traditional factory production lines into educational workshops and even student dorm rooms, the output of most consumer-grade fabrication tools, such as 3D printers, lacks the smooth finishing possible with industrial machines. The diversity in materials and possible sizes are limited compared to those available through industrial processes. Still, printed objects can be used in various ways, such as a replacement for a broken part in a coffee maker, a rapid prototype for testing a concept, or an intentional trigger to elicit a response from an audience (Figure 1). While intellectual stimulation from fine art objects may not be associated with immediate practicality, the first two examples can be classified as utilitarian objects that can function regardless of their outward appearance and despite the duration of their intended application.

A lack of attention to the *formgiving* of the object; the process of giving form to that which has not yet taken shape (Ingels, 2020), stands in stark contrast to the care and attention to detail that a craftsperson would take over how something is made and put together.

The skills needed for such a process are developed by actively working and interacting with materials. These materials can range from leather, textile, wood, or glass to 'spider silk' grown in a lab and pictures taken with a digital camera or generated by AI (Wijntjes & Van Middelkoop, 2023). From inception, designing and making can be seen as the translation of ideas into diverse material manifestations in both the physical and digital world.

However, some contend that the concept of craft is limited to application within the tangible realm, exclusively involving the creation of physical objects. This asserts that true craft requires manual production, predominantly by an individual's hands, only occasionally assisted by power tools such as an electric pottery wheel that might be used by a ceramist or a pneumatic chisel employed by a stone worker (Crombez, 2019). This limited view of what craft materials are and which essential techniques apply in the craft-making process feeds into a persistent image of craft as an old-fashioned tradition that does not belong to modern society

or relate to any of the 21st-century skills such as creativity and innovation. Instead, 'crafts are said to represent mainly past and repetition of motor skills, not the creation of unique creative ideas' (Seitamaa-Hakkarainen, 2017).

Cognitive Apprenticeship

The act of making is a form of cognitive activity. Research in the humanities and social sciences regarding the generation of knowledge through practical experiences highlights that the process of making can (1) cultivate intelligence, creativity, and skills in individuals; (2) foster social unity across diverse backgrounds; and (3) promote sustainable perspectives on both a local and global level (Lehmann, 2020). In secondary vocational education (mbo), gaining practical experience is an integral part of training. By the time students graduate from a creative vocational school, they will have gained no less than 1,000 hours of direct experience during internships alone (HKU, 2021). This number of hours increases if the hours spent on making in regular classes are included. What is done in all these hours and what is learned depends significantly on the individual student, the task(s) at hand, the guidance involved, and the learning context. Variation in these primary aspects has a significant influence. For example, in Scandinavian countries such as Finland, craft education is an independent and compulsory subject included in the National Core Curriculum for Basic Education (Seitamaa-Hakkarainen, 2017). Here, learning by making, in accordance with Papert's constructionism, posits that learners are not only building abstract knowledge but also creating new artefacts and cultivating new ways of thinking and acting (Seitamaa-Hakkarainen, 2017).

The practice of materialisation is a tool of meaning in the everyday practices of making sense and influencing new meaning in our shared and interconnected semiotic landscapes. 'By engaging in physical activities and producing material products that have meaning for us, we make it possible for those meanings to mediate our future actions' (Lemke, 2000). We can also take advantage of another area of potential that is unique to the context of material production (including visual or digital) in both formalised education and practice by utilising the processes or expertise to externalise cognition for reflection and development (Pescatore Frisk & Van Middelkoop, 2023). Cognitive Apprenticeship (CA) extends

learning models from traditional apprenticeship (Collins et al., 1987) as a means to make cognitive and metacognitive processes more visible (Collins et al., 1991). Collins et al. (1987) point to four primary distinctions between traditional apprenticeship and CA: (1) the externalisation of cognitive skills and processes that usually are internalised as an available resource for reflection and development, (2) with a 'relatively transparent' or logical relationship to the outcome, (3) the optimised design and sequencing of tasks, problems, skills, and knowledge in contrast to 'job demands', and (4) the decontextualization or abstraction of knowledge through a diversity of contexts.

In addition to the four points above, situated learning and intrinsic motivation (sub-categories of the sociological principle for designing cognitive apprenticeship environments) are relevant to this discussion. We can explore how contemporary workshops are sites for the production of knowledge. The learning environments utilise situated practice, where new skills, ideas, and approaches are explored, understood, generalised, and abstracted in the contexts of real-life practice and/or using knowledge from real-life experiences. Second, as the materialisation of cognition, iterative cycles explore varied techniques and their implications, building an understanding of meaning potential and the distributed networks that comprise it. A significant tool for transcending pragmatic boundaries is reflected in the third distinction between traditional apprenticeship and CA: 'the optimised design and sequencing of tasks, problems, skills, and knowledge in contrast to job demands' (Collins et al., 1991). The externalisation of cognitive processes in situated practice, and the transfer or generalisation of skills across diverse contexts while resisting (or being able to resist) outcome-centric processes, rationalisation, and normalisation of 'job demands' is a proven catalyst for development and innovation.

Additionally, the foregrounding of production and externalisation reveals and refines attention to discourse (material, digital, or visual). Often, the lifted restriction to 'job demands' allows a sudden broadening of perspective and human connection as the expertise in material production also exerts control on shared networks of semiotic potential. In other words, the relational, material, visual, and digital ideologies that structure our social life and identities enter the experimental workshop and, ultimately, the maker's expertise.

Challenging Constraints

In *Return to Default* and *A Vorkurs for Machines*, the materialisation, tools, and practices are structures that enter into a conceptual, critical, and experiential dialog with contemporary culture. 'While digital infrastructure is often out of our immediate observation, its influence penetrates all facets of life, especially visual and material ideology' (Pescatore Frisk & Van Middelkoop, 2023). *Return to Default* (Figure 2) challenges our expectations of material constraints, simulating the characteristics and operations of digital infrastructure. In *A Vorkurs for Machines* (Figure 5), painting robot BobRob produces material objects that are overwhelmingly non-human; however, because digital infrastructures are intertwined with everyday life, we understand this material representation as a type of stylistic representation or modality tied to technology instead of a generative process devoid of human presence. Suppose BobRob's portfolio was submitted to the Bauhaus as an admission requirement for entry into its foundational course 100 years ago. In that case, we can be nearly certain that this anomaly would be apparent and alien. 'Differences in human culture are regulated, constructed, and mutually influenced by the material discourses that comprise life as we know it. As core aspects of human culture, such artefacts are the media of social structure' (Pescatore Frisk & Pauwels, 2019). 'Global infrastructures of research, design and manufacturing mean that the material world is already understood as a designed world, in other words as a world that mediates between everyday and professional domains, and defines and positions people in political hierarchies and structures, through the qualities of thought and consideration that it embodies' (Drazin, 2020).

Figure 2. 'Just as it is important to recycle materials, Moreno Schweikle and Janne Schimmel believe that it is vital to recycle shapes. They took three functionally perfected yet uninspiring office chair designs, digitally manipulated their DNA, and relaunched them into the physical world' (DAE, 2018).

Return to Default was conceived as a graduation project at Design Academy Eindhoven and built on earlier experiments that took place in the setting of a course that asked students to explore the relationship between humans and machines and the respective role of designers. The students were challenged to explore the possibilities of materialising a digital render in the real world (Figure 3) to evoke or surpass the same appeal as the digital original. This meant that the makers had to convince production companies outside of the institution of the value of their work.

The workshop inside of the school needed to be expanded. Since the exhibition of the results of this challenge during the Dutch Design Week in 2018, the makers still receive occasional requests from private collectors to reproduce their artefact, which is partially done in their own workshop (Figure 4).

Figure 3. 'Three standard office seats have been digitally stretched, blown up and morphed. The off-size frames were 3D-printed, then traditionally upholstered and reintroduced into the office' (DAE, 2018).

The collaboration with the robotics experts at the Applied Labs in Delft was especially valuable during the attempt to create a Bauhaus-inspired *Vorkurs for Machines*. A simple remark from a maker's perspective, such as 'let's have BobRob use oil paint instead, as it dries much slower than acrylic paint,' was seen by an engineer as a Eureka moment. Entirely focused on the hand movement of the painting robot instead of what the hand was

doing, the aspect of paint drying too quickly was solved (by the engineer) by shortening the brush stroke and allowing the robot hand to dip into the paint more often. With the paint drying less quickly, the strokes became smoother, but also less authentic.

Figure 4. 'A lean conference chair is blown up into an overstuffed version' (DAE, 2018).

After the experiments, BobRob was moved to an external workshop at Royal Delft (*De Koninklijke Porceleyne Fles*), a producer of high-quality Delft Blue since 1653, that established an experimental department where young potters could experiment with the factory's materials and ovens in 1956. Here, BobRob and five bachelor students from the TU Delft were invited by Head of Design and TU Delft IDE (Industrial Design Engineering) alumnus Joffrey Walonker to take their project *Digital Delft Blue* to a higher level and test the robot's ability to match the skill level of an in-house master painter. Although BobRob, in practice, was far from achieving the level of an expert painter, the robot did reach a point where a practical application for Royal Delft became clear (Mols, 2021), providing underdrawings for human painters—the role of an apprentice.

Experimental projects like this are extremely valuable and equally as rare. Limited access to high-tech tools, such as a robot arm, results in students working in general workshops in design schools not experiencing and perhaps even stretching the limitations of what is possible. External workshops (embedded in companies)

not only have more advanced machines and are better equipped, but they also have technological expertise and experience that can come in handy when their processes are reverse-engineered, allowing for the un-making over waste materials, dissecting overproduction in useful components (e.g., materials) that can be repurposed in various ways.

Testing the boundaries of what is possible in manufacturing led to the neck watch of Bruno Ninaber van Eyben, who went public as the first self-producing designer/designer-maker in 1976. One's own needs and/or dissatisfaction with the existing supply have always been a logical reason for designers to produce themselves. These initiatives often lead to series production for third parties. Because a manufacturer takes up the product or due to the circle of enthusiasts expanding, as happened with the fluorescent lamp by Bruno Ninaber van Eyben (Huygen, 1984) and the overstuffed armchair from *Return to Default*.

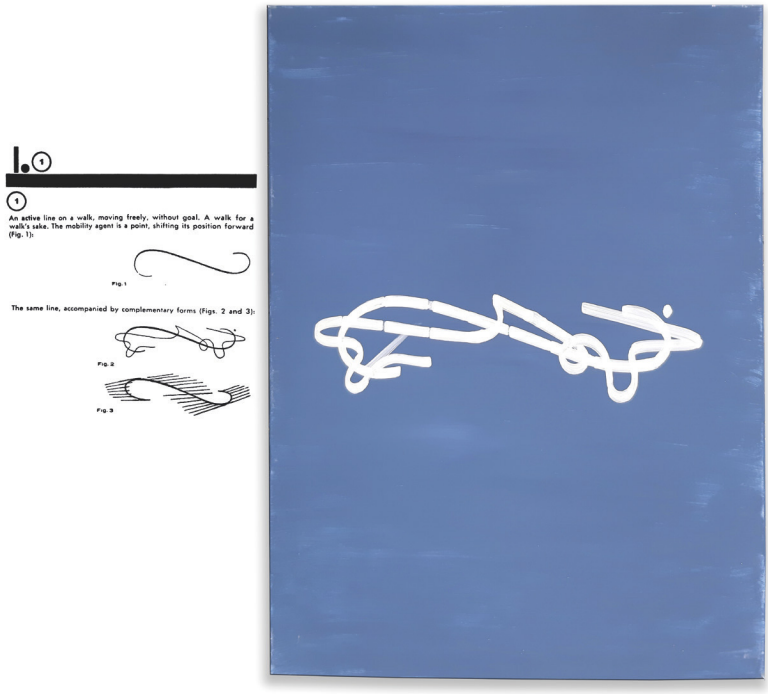

Figure 5. A walk for a walk's sake (2019). Based on a Bauhaus exercise by Paul Klee. The white stroke painted by BobRob is interrupted multiple times in a visible pattern. To avoid the paint from drying too quickly, the robot arm was programmed to get fresh acrylic paint multiple times along the way (Van Middelkoop, 2023).

Facilitating Transitions

Based on the concept of a Living Lab, *Transition Atelier The Last Makers* is a real-world environment, community, and workplace where humans (e.g., students, researchers, instructors, and business employees) collaborate with non-humans to learn from one another, co-create, test, and critically evaluate new and old technologies, material properties, and possible futures in a real-life setting. It serves as a platform for reflection, innovation, experimentation, and learning, allowing for the direct involvement of end-users (lifelong learners) in the design, development, and making process. Like a Living Lab, the transition atelier facilitates the gathering of authentic feedback, insights, and data, which can inform the refinement and improvement of innovations and test-run possible alternatives before wider deployment in education.

The transition atelier fosters interdisciplinary collaboration because, despite their coexistence and cross-pollination of learning in and between programs, their incorporated disciplines and available workshops do not always occur within and in between the workshops mentioned before and not within and among the independent creative secondary vocational schools (mbo) themselves (Van Middelkoop et al., 2024). This is even though an educational system's most essential function must be to facilitate the transition from one layer of expertise to the next (Lawson & Dorst, 2009), which is a challenging task.

For example, even though secondary vocational education (mbo) graduates are expected to be able to move on to higher vocational education (hbo) fluently, many mbo graduates discontinue their studies before they obtain an hbo diploma (Ministerie van OCW, 2023), or do not even consider continuing their education at this advanced level on several grounds; e.g., because a suitable and equally specialised follow-up program does not exist (Van Middelkoop et al., 2024), or because the level is preconceived as too high, time-consuming, or expensive. On top of this, the labour market is favourable (Van den Broek et al., 2020) and, therefore, an attractive alternative for continued education in practice.

Still, a more natural continuation should be possible of learning experiences within creative secondary vocational schools and art academies with applied art and design programs. In addition to their historical roots in arts and crafts education, both art schools

and creative vocational schools value self-expression through creative practices. They share the use of studios, workshops, and stations—physical spaces dedicated to making—that are central to creative education and are key places for experimentation. However, relevant innovation resulting from actual (applied) design research within these experimental learning and innovation environments is often overlooked (Van Middelkoop, 2022), undervalued or disregarded, and it is sometimes seen as original rather than functional (Ribbens, 2012). This is despite practice-based research being a primary source for development and innovation, also if it starts with simple curiosity about the properties of a material or a subjective personal experience.

A complicating factor is that research is only officially conducted on two of the three educational levels currently in the Netherlands, within higher vocational education (universities of applied science; hbo), and scientific education (universities; wo). Legally, secondary vocational education (mbo) has no role in research. At the same time, mbo closely aligns with the business sector, where significant innovation occurs. Because of this, outgoing Minister of Education, Culture, and Science Robbert Dijkgraaf, in 2023, announced his plans to give secondary vocational education (mbo) a full role in innovation and research (ScienceGuide, 2023).

This does not mean that research has not already been taking place within this setting. Following the successful development of practice-based research professorships or lectorates in hbo and the strengthening of their positioning in the official research landscape that used to be dominated by universities, 88 so-called practorates have been set up during the past ten years, and twelve are currently in the process of formation (Practoraten.nl, 2023). All practorates have in common that they aim to bridge the gap between education, research, (regional) business, and the future creative workforce. At creative secondary vocational school, SintLucas' Practorate, Meaningful Creativity (*betekenisvolle creativiteit*) is done through Research through Design, which in this context takes a prominent role in establishing ways to prepare for the future through (practising) traditional crafts. In order to do so, the practorate is expanding the practice of doing

research as a (recognized) part of the process of designing products (and services) into the design of activities and artefacts that serve as crucial components in the process of generating and communicating knowledge (Stappers & Giaccardi, 2014).

Crossing Boundaries

With its practorate, SintLucas has established its own experimental learning and innovation environment in previously unexplored territory. Fostering an unconventional approach to long-term problem-solving, this creative space encourages individuals to make bold decisions, even in the face of uncertainty. In pursuit of this objective, the protectorate is currently preparing the next step: a pilot project named Transition Atelier The Last Makers (*Transitieatelier De Laatste Makers*), in which creative thinking will be extended into critical doing and a future-proof curriculum centred around (un)making will be co-created.

In order to facilitate this, the practorate has extended the idea of boundary objects (including project briefings for students) by addressing the potential of boundary materials to generate new ideas, locate unseen knowledges, and create alternative routes to the future (Van Middelkoop & Van Harn, 2023). Materials, in all [their] resilience and autonomy (Focillon, 1934), and not limited to the ones that are the central focus within the creative craftsmanship programs offered at SintLucas in Boxtel, play a vital role in this dynamic process. A process that is not primarily focused on solving short-term problems like 'how to get rid of abundantly and commercially produced residual materials' but rather on reconsidering possible futures based on sustainable decisions made during the (design) process of making.

In order to do so, new perspectives on collaboration, in which the material is an active participant, are urgently needed. Like many other collaborations between educationalists and researchers, the outcome and follow-up depend on social resources such as time, space, and the quality of interactions among all parties involved. Although the ultimate intention remains to bridge the gap between education, research, (regional) business, and the future creative workforce, the learning process so far has primarily taken place within the context of SintLucas itself, not beyond.

Shaping sustainable collaborations requires attention and patience. In practice, gradually seeking justification for choices and critically reflecting on them often proves challenging. However, when designing collaborations that contribute to knowledge development and provide space for education, it is crucial to continue to think further about their application and long-term consequences.

Exploring the material in alternative ways (Figure 6)—from using placebos, e.g., scrap leather as a temporary stand-in for future alternatives such as cell-cultured collagen-based leather (Gerritsen, 2018), and digital skins in 3D modelling software, where the material can be questioned and applied in exaggerated quantities and without hindrance—gives rise to new roles while established ones fade away, making the meaning of creativity and critical craftsmanship in sustainable collaborations increasingly clear.

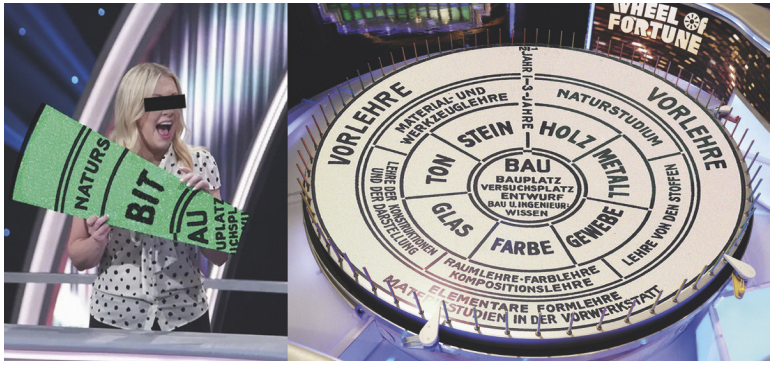

Figure 6. Data as material. Modification of the diagrammatic representation of the Bauhaus syllabus by Walter Gropius (Van Middelkoop, 2019).

Bibliography

- Broek, A. van den, Cuppen, J., Ramakers, C., Termorshuizen, T., & Vroegh, T. (2020). *Dalende doorstroom mbo-hbo: waarom stroomt een steeds kleiner aandeel van de mbo-studenten door naar het hbo?* Nijmegen: ResearchNed.
- Brown, J.S., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher, 18*(1), 32-42.
- Clarke, M., & Clarke, D. S. (2010). *The Concise Oxford Dictionary of Art Terms*. Oxford University Press. https://doi.org/10.1093/acref/9780199569922.001.0001

- Collins, A., Brown, J. S., & Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. *American Educator, 15*(3), 6-11, 38-46.
- Collins, A., Brown, J. S., & Newman, S. E. (1987). Cognitive apprenticeship: Teaching the craft of reading, writing and mathematics (Technical Report No. 403). BBN Laboratories, Cambridge, MA. Centre for the Study of Reading, University of Illinois.
- Consortium Creatief Vakman. (2017). *Creatief Vakman*. https://creatiefvakman.nl/index.php/consortium-creatief-vakman-2/
- DAE, Man and Communication. (2018). *Return to Default*. Dae.wiki. https://www.designacademy.nl/p/study-at-dae/graduation-show/graduation-projects/janne-schimmel-return-to-default
- De Vries, M. (2010). *Represent Koninklijke Tichelaar*.
- Drazin, A. (2020). Design Anthropology in Context: An Introduction to Design Materiality and Collaborative Thinking (1st ed.). Routledge. https://doi.org/10.4324/9781315688732
- Focillon, H. (1934). *Vie des formes*. Paris: Librairie Ernest Leroux, Presses Universitaires de France.
- Gerritsen, W. (2018, June 15). *Maastrichts biotechbedrijf kan leer kweken*. De Limburger. https://www.limburger.nl/cnt/dmf20180614_00064062.
- Haemers, J. (2016). Ambachtslieden in de stad (uit: 'Gouden tijden', ed. V. Lambert & P. Stabel). Kuleuven. https://www.academia.edu/26722152/Ambachtslieden_in_de_stad_uit_Gouden_tijden_ed_V_Lambert_and_P_Stabel_
- HKU. (2021). *Interview met Marieke Gervers*. https://www.hku.nl/het-werk-van-hku/verhalen/interview-met-marieke-gervers
- Huygen, F. (1984). Tussen ambacht en industrie 1. *Items 14*. https://itemsmagazine.com/1984/10/1/tussen-ambacht-en-industrie-1/.
- It's Nice That. (2016, May 12). *Michiel Schuurman's giant illustrations meditate on the tiniest of details.* https://www.itsnicethat.com/articles/michiel-schuurman-illustration-vlisco-120516
- Ingels, B. (2020). *BIG. Formgiving. an Architectural Future History*.
- Lawson, B., & Dorst, K. (2009). *Design expertise*.

- Lehmann, A.S. (2020, March 1). Curious hands: moving making to the core of education. *NWO*. https://www.nwo.nl/en/projects/ciscкc205
- Meihuizen, J. (2009). *Glas(s), expositie en boek over 40 jaar glas aan de Rietveld Academie*. Designgeschiedenis. https://www.designhistory.nl/2009/glass-expositie-en-boek-over-40-jaar-glas-aan-de-rietveld-academie/
- Ministerie van Onderwijs, Cultuur en Wetenschap. (2023, April 19). Doorstroom studenten mbo. *Middelbaar Beroepsonderwijs | OCW in Cijfers*. https://www.ocwincijfers.nl/sectoren/middelbaar-beroepsonderwijs/studenten/doorstroom-studenten-mbo#:~:text=Rond%2030%25%20van%20de%20instroom,haalt%2C%20rond%20de%2050%25
- Mols, B. (2021). *Paint robot Bob Rob serves Delft Blue apprenticeship.* TU Delft Stories. https://www.tudelft.nl/en/stories/articles/paint-robot-bob-rob-serves-delft-blue-apprenticeship
- Nieuwsblad van het Zuiden. (1960, September 14). Schilderspatroons der naaste toekomst in nieuw gebouw.
- Pescatore Frisk, R. & Pauwels, L. (2019). The shared stories that written words tell when no one is reading: exploring modality in typographic landscapes as an ecosocial semiotic system. *Visual Communication*. https://doi.org/10.1177/1470357219860086
- Pescatore Frisk, R. & Van Middelkoop, C. (2023). Situating the (Un) Common Landscapes of Shared Futures: Developing Speculation as a Co-Design Framework of Cognitive Apprenticeship to Empower Diverse Stakeholders and Contest Bias. *Research and Advances in Education, 2*(12), 41–65.
- Pevsner, N. (1940). *Academies of art, past and present*.
- Practoraten.nl (2023). *Practoraten op de kaart*. https://www.practoraten.nl/practoraten/
- Prak, N. L. (1979). *Geschiedenis van het ontwerp-onderwijs*. Cantecleer bv.
- Rao, S. & Singh, S. (2018). Max Weber's Contribution to the Sociology of Education: A Critical Appreciation. *Contemporary Education Dialogue, 15*, 73-92. https://doi.org/10.1177/0973184917744964
- Ray, J. A. (1670). *Handbook of Proverbs*.

- Restauratoren Nederland. (2023, September 18). *Opleiding en bijscholing – Restauratoren Nederland.* https://www.restauratoren.nl/over-restauratie/opleiding-en-bijscholing/
- Ritzer, G. (2007). The Weberian Theory of Rationalization and the McDonaldization of Contemporary Society.
- Ribbens, A. (2012, October 13). *Design dat er toe doet.* NRC. https://www.nrc.nl/nieuws/2012/10/13/design-dat-er-toe-doet-12563466-a30610.
- Rutten, P.W.M, & Cramer F., Chabot J., & Troxler P. (2013). Reinventing the art school, 21st century. Rotterdam University of Applied Sciences. https://www.rotterdamuas.com/research/projects-and-publications/pub/reinventing-the-art-school-21st-century/71fc5168-4e25-4b18-b7c7-efba2042ea5f/
- Simon Thomas, M. (1998). De Leer van het ornament: Versieren volgens voorschrift, 1850-1930, *Studies in the Decorative Arts, 6*(1), 127–131. https://doi.org/10.1086/studdecoarts.6.1.40662670
- Simon Thomas, M. (2008). *Dutch Design. A History*.
- SintLucas. (2023, November 17). *SintLucas 75 jaar*. https://www.sintlucas.nl/sintlucas-75-jaar.
- Stappers, P. & Giaccardi, E. (2014, January 1). *Research through Design*. Interaction Design Foundation – *IxDF*. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/research-through-design.
- Van den Eijnde, J.N.M. (2015). *Het huis van ik : ideologie en theorie in het Nederlandse vormgevingsonderwijs*. ArtEZZ Press. https://scholarlypublications.universiteitleiden.nl/access/item:2890489/view
- ScienceGuide (2023, September 19). *Dijkgraaf wil zijn waaier doortrekken naar het onderzoek in het hbo en mbo*. https://www.scienceguide.nl/2023/09/dijkgraaf-wil-zijn-waaier-doortrekken-naar-het-onderzoek-in-het-hbo-en-mbo/.
- Van Middelkoop, C. (2019). 'Bauhaus', *'Anderen bekeken ook' – Het belang van het Bauhaus voor het ontwerponderwijs van morgen.* In Symposium nederland bauhaus Museum Boijmans van Beuningen.

- Van Middelkoop, C. (2022). Un-/Blackboxing the creative potential of Dutch secondary vocational education. In *Collaboration for Impact* (pp. 72-73). https://www.nadr.nl/wp-content/uploads/2023/02/NADR_CollaborationForImpact_RGB.pdf
- Van Middelkoop, C. (2023). De Laatste Makers. *SintLucas.* https://online.fliphtml5.com/acdtk/jukw/#p=1
- Van Middelkoop, C., & Van Harn, R. (2023). Leren van Zink? De rol van grensmateriaal in tegenspel. In M. Buizer, J. Schueler, & L. van Arkel (Eds.), *Transitiezones: navigeren op weerstand*. *Accelerating the Circular Economy Zuid-Holland (ACCEZ).*
- Van Middelkoop, C., Van Harn, R., Roebroek, D., Koenen, L., & Jonkers, S. (2024). *Onze Taal*. SintLucas.
- Van Voorst tot Voorst, J.M.W. (1980). Nederland op de Wereldtentoonstelling van 1851 te Londen. *Nederlands Kunsthistorisch Jaarboek, 31*, pp. 475-492.
- Wijntjes, M., & van Middelkoop, C. (2024). A framework connecting vision and depiction. *Visual Cognition.* Teaching Sensation and perception. https://doi.org/10.31234/osf.io/geyht
- Wui, M.G.L., & Leviste, E.N.P. (2023). Weber, Education, and the Rise of Modern Societies. In: Geier, B.A. (eds) *The Palgrave Handbook of Educational Thinkers*. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-81037-5_116-1