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Original
Healthcare Sustainability: Can Design Education Trigger Systemic Transitions? / Pereno, A.. - ELETTRONICO. - (2024). (13th Relating Systems Thinking and Design Symposium Oslo 22-24 October 2024).

Availability:
This version is available at: 11583/3005375 since: 2025-11-24T13:27:11Z

Publisher:
Systemic Design Association

Published
DOI:

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25 November 2026

RIVERS OF CONVERSATIONS
RELATING SYSTEMS THINKING & DESIGN
RSD13 | OCTOBER 2024

Healthcare Sustainability: Can Design Education Trigger Systemic Transitions?

Amina Pereno

The healthcare sector is undergoing a shift towards sustainability, understood as a set of values and practices that integrate planetary health, personal responsibility, and cultural plurality. While "Good Health" is a central Sustainable Development Goal, its achievement remains complex and fragmented. Establishing fertile ground for systemic change is therefore essential. Recent studies on sustainable healthcare emphasise the importance of education as a starting point for building awareness and capacity within the sector. This paper draws on two educational experiences related to healthcare sustainability and reflects on the role of design education in this transition. It discusses insights from an interdisciplinary European project on sustainable design for MedTech, which informed a second initiative representing a pedagogical evolution toward systemic design. These practices are analysed in light of current debates on design education and sustainability in healthcare. Building on existing literature, the paper identifies four areas where design and healthcare intersect, outlining opportunities for future collaboration between the two fields. Ultimately, it aims to offer practical and theoretical insights to advance the discussion on how systemic design can contribute to developing effective educational pathways that foster sustainability transitions in complex systems such as healthcare.

KEYWORDS: systemic design, healthcare, sustainability, design education.

RSD TOPICS: Health & Well-Being, Learning & Education.

Design and Healthcare: A Shared Path

Since the 1990s, the “do not harm” principle has driven the first steps toward a socio-environmental consciousness of health professionals. Moving beyond, health practitioners acknowledged that «only through understanding the connectivity and contribution of modern health care practice to ecological issues can physicians work toward aligning commitment to individual care with public and planetary health» (Sherman & Ryan, 2010). Today, the ecological dimension runs into broader implications around inclusivity, plurality, empowerment, and, in general, a more comprehensive approach to care.

From this perspective, design disciplines find fertile ground in the health sector because of their ability to deal with complex problems, and the ways designers create and deal with ‘frames’ (Dorst, 2011).

The modes and scope of collaboration between design and healthcare are many: from sustainable medical product design, to servitization of health treatments, to envisioning future health scenarios. The experience design gained in other large public sectors is relevant to accelerating the shift of the healthcare sector towards sustainability. However, current studies agree on the importance (and urgency) of education as a starting point to build cultural awareness within the sector.

This presentation does not aim to reflect on the relationship between design, healthcare and sustainability, which has been consolidating over the past 15 years. Rather, it focuses on how design education can support sustainable healthcare.

To do this, the presentation starts with two practical and interconnected experiences of systemic design education projects and then elaborates on them in light of the current debate on design education. The author defines four methodological features of design education that could support the sustainable transition of the health sector.

Lessons learned from two design education projects in healthcare

In 2019, the results of a comprehensive multi-stakeholder foresight project (Pereno & Eriksson, 2020) highlighted the need to undertake tangible initiatives on sustainable healthcare education. This need was prominent in the health industry. Indeed, while hospitals and healthcare organizations have been providing training courses on sustainability, industry is trudging to build new skills in line with the ongoing transition.

For this reason, a cross-sectoral European partnership, coordinated by Sys - Systemic Design Lab of the Politecnico di Torino, was formed in 2021 to propose an educational project targeted at the MedTech sector. The project was funded by EIT Manufacturing, a public body supported by the European Commission.

The SysteMA project (2022) led to the development of an online training program aimed at designers and professionals in the MedTech industry, to introduce them to the topics of sustainable healthcare and systemic design. The project's results showed key potentials, discussed further, which prompted the coordinators to elevate the educational experience to a higher level, designing and implementing the DesHealth project (2023-2026), funded by the Erasmus+ Program of the European Commission and currently ongoing. In this second project, a significant portion of the partnership has changed to engage health providers and to integrate new crucial skills. Below, the assumptions, objectives, results, and limitations of the ongoing educational journey are presented.

Training professionals to design sustainable MedTech products from a systemic view (SysteMA)

As mentioned above, SysteMA was designed to address the urgent need for sustainable and systemic design expertise in the European MedTech industry. The Systemic Design Lab of the Politecnico di Torino was the project coordinator and responsible for creating the training program together with TEM Foundation, a Swedish organization experienced in sustainable healthcare. Four industrial partners co-designed the training

tools, bringing the perspective of SME clusters (Bioindustry Park 'Silvano Fumero' and MedSilesia) and large medical device companies (Stryker, GVS).

The main project outcome was an interdisciplinary, online training program targeting MedTech designers, engineers, and managers. The long-term goal was to ensure that the knowledge gained can support European companies in addressing the sustainable transition of healthcare systems, based on creating industrial symbioses focused on reuse, remanufacturing, and recycling strategies and optimizing material and energy flows.

In the first concept, the course was supposed to start with an introduction to sustainable healthcare and then delve into systemic design tools that could take MedTech design a step further. In the early stage of the project, we analyzed the state of knowledge of European professionals, and realized how the disparity between different countries, as well as between small and large companies, called for more work on basic concepts. Before teaching advanced methods, there was a need to enable learners to understand basic concepts about sustainable healthcare, sustainable design, and systemic design.

Thus, the online course was divided into three learning modules (Figure 1) to meet the learners' needs, emphasizing product-related knowledge and focusing on a systemic understanding of product and service design.

The course was then implemented on EIT Manufacturing's e-learning platform and involved 120 pilot learners from the MedTech industry who experienced the training and dialogued with the partnership to improve it and get to today's version.

Other important lessons learned relate to complexity. When dealing with complex systems, we carry out the risk of thinking about stakeholders by categories: industries, hospitals, health clinics, policy-makers, etc. Choosing the MedTech industry was also aimed at narrowing the scope to deliver a more pragmatic educational experience. As we delved deeper into the industry, we realized the risk of simplifying complexity. The “MedTech industry” group included designers, managers, engineers, life sciences experts who deal with small healthcare products as well as large technological machines for advanced therapies. In this sense, the mediation of industry partners has been

crucial in co-designing training content that meets the needs of such a wide and differentiated audience.

The last lesson concerns online training. A digital course can reach more people than an in-person one, both in space and time. In addition, the self-paced mode is congenial with professional practice. However, the lack of a direct relationship between lecturer and learner has two main shortcomings: the lack of direct qualitative feedback on the training and the difficulty of applying what has been learned to practice since interpretation and implementation are totally up to the learner.

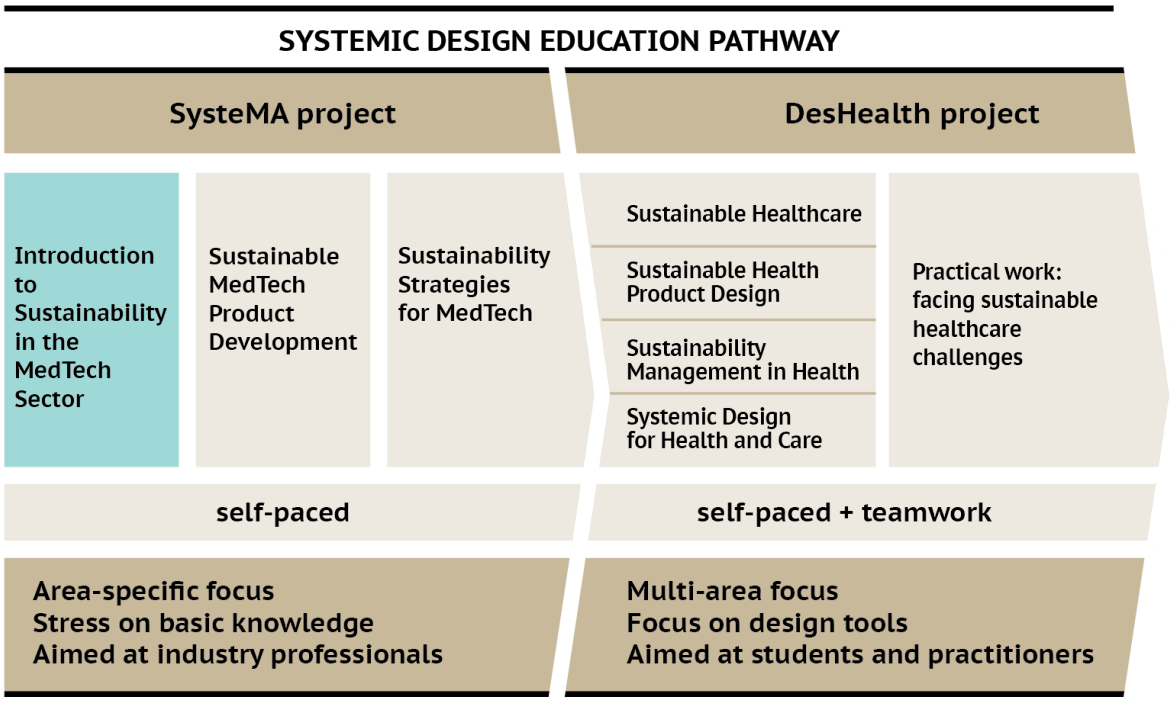

Figure 1 Visualisation of the educational path followed within the two projects (source: Author)

Building a systemic educational path for current and future designers in the health sector (DesHealth)

Building on the experience of SysteMA, the Systemic Design Lab of Politecnico di Torino and TEM Foundation co-designed a training project that addresses some of the gaps of the previous project.

First, it integrates the perspectives of health and care professionals. Second, it deepens the systemic approaches to healthcare products, which is a key issue for both designers and users. Finally, it broadens the audience to students, by working with generations of future professionals who today have time and ambition to change the *status quo*.

Hence, besides Politecnico di Torino and TEM Foundation, the DesHealth project involved new academics experienced in circular product design (TU Delft) and in sustainability management (ESCI-UPF) with an edge on the social and cultural aspects. A prominent role was maintained for professional partners to bring the views of industry (Bioindustry Park 'Silvano Fumero'), hospital care (Erasmus Medical Center), and community care (LaUniò).

The project aims to create a training program that combines online training on theoretical knowledge and tools, and teamwork supervised by academic and practitioner mentors. This leverages the broad reach of the online training, which will be open access, while building a direct relationship between teachers and learners to delve into the practical aspects of a systemic project[1].

Ideally, the two projects are a pathway to co-creating design education for sustainable healthcare, which opens up several reflections embedded in a broader debate, discussed in the next section.

Open reflections in the light of contemporary debate

The current debate on design education includes different perspectives that agree on a disciplinary shift toward complexity. In particular, the scopes and scales of design problems have broadened, moving from a focus on artifacts to a systemic approach that enables learners to frame problems (Pontis & Van Der Waarde, 2020). Moreover, an increasing number of design curricula have adopted project-based learning rooted in real-world problems to prepare designers for a complex and articulated world (Davis, 2017). From this perspective, Meyer and Norman (2020) stress the distinction between *training*, i.e., the focus on craft skills that characterizes traditional design instruction, and design education, which means "gaining a deep

[1] https://deshealth.polito.it/

understanding of the underlying principles and historical underpinnings of what we learn" (Frascara, 2020, p. 108). Both are important, but it is evident, Don Norman says, that in the newer forms of design the emphasis on craft training is reduced in favor of education, because complex projects, such as the design of health services, require a broader understanding of culture, philosophy, history, politics, and ethics of design. In a word, design education must be anticipatory, not just reactive. On this point, Meredith Davis argues that, in current design curricula, *"conditions call for studies shaped by systems-level thinking — what people want and need; what the context demands; how design is planned, produced, and delivered; the outcomes we expect of a design process (including principles or guidelines); how we evaluate outcomes; and the tools and methods for studying these things"* (Frascara, 2020, p. 112).

This shift is neatly summarized in the recent opening article of the special issue "Future of Design Education," in which Davis and Dubberly (2023) outline ten overarching principles guiding design and design education:

1. Think in terms of systems;
2. Pay attention to feedback;
3. Act at the appropriate scale;
4. Consider consequences, intended and otherwise;
5. View information systems as the new material of design;
6. Decenter humans to restore and sustain ecological balance;
7. Strive for inclusivity;
8. Respect the importance of community, place, and culture;
9. Support decisions with evidence;
10. Accept accountability and behave ethically.

The principles proposed by Davis and Dubberly (2023) offer important insights into design education and its relationship to healthcare.

In Figure 2, developed by the author, the ten principles support the definition of four approaches that, in the author's opinion, characterize current patterns of design education:

1. **Think in systems**. The systemic shift in contemporary design is reflected in design education. This ability of designers is relevant to other disciplines because it enables framing complex situations and identifying leverage points to address systemic change. However, it is not just about systems-thinking, but about learning how to deal with complexity through practical and pragmatic skills that mark the work of designers within and through our societies (Vink, 2023).
2. **Seek plurality**. Many designers advocate for a "pluriversal" approach to design and design education (Noel et al., 2023) to enhance a range of locally rooted perspectives and a more complex and comprehensive view of the design world(s). It is not only a matter of inclusiveness in educational dynamics but also the urge to consider plurality in designing products, services, and systems.
3. **Sustain an ecological balance**. Cultural and political aspects are more recently included in the dimensions of sustainability, insisting on the value and role of individuals in sustainable development. Designers must consider the interdependence between human activity and environmental systems to remedy negative impacts and restore planet health. This role builds on the sense of personal accountability, prompting designers to reconnect with the social and ecological landscapes to which they belong (Boehnert, Sinclair, & Dewberry, 2022).
4. **Design information systems.** Intermingling the physical and virtual worlds is expanding, and design and design education act within networks of smart connected products and product-service ecologies. Big data, algorithms, AIs, and other computational tools monitor physical reality and inform the decisions of the stakeholders involved as well as the relationships among them (Dubberly & Pangaro, 2019). Designers are called to devise incremental strategies and ethical implications of their practice in a *phygital* world.

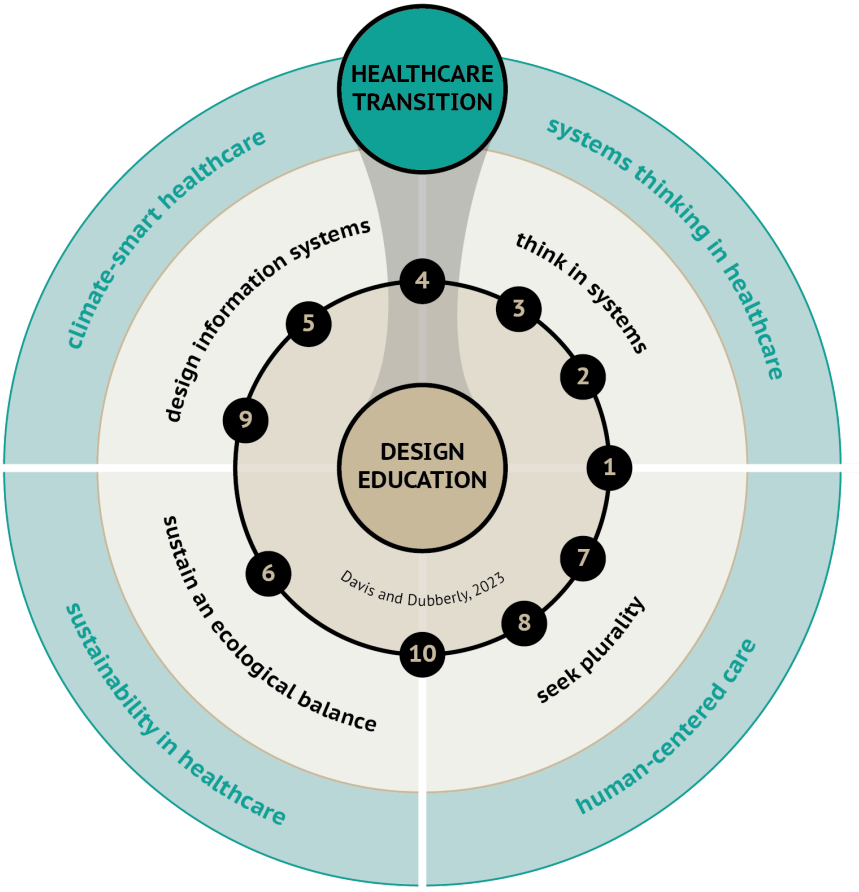

Figure 2. A schematization of the connections between the evolution of design education and the transitional approach to healthcare. Source: Author (starting from Davis & Dubberly, 2023)

How does design education meet healthcare transition?

Building on the four approaches to design education and the practical education experience discussed above, the presentation highlights possible contributions of design to the shift of health systems. In particular, there are four perspectives that, in the author's view, are prominent.

Systems thinking in healthcare. To date, the approach to health system transition has often lacked a systemic vision; it has moved on specific issues ideally connected but, in practice, approached piecemeal. An outstanding example is the third UN Sustainable Development Goal "Good Health and Well Being," which proposes ambitious targets that collectively contribute to the concept of Good Health but are addressed as separate

challenges. As Herbert and Best (2011) note, “we need new ways of thinking and of working in order to accommodate the complexity of the challenges in and urgent need for health system innovation and change”. Healthcare innovation comes through systems thinking. Over the past 15 years, this idea has consolidated, but literature shows that it is still promoted by niches of practitioners and always at a theoretical level, while practical applications in the medical and healthcare field are lacking (Rusoja et al., 2018). Systemic design tools could support health practitioners and designers engaged in the sector to leap from theory to practice.

Human-centered care. Patient-centered, person-centered, and human-centered are sometimes used interchangeably; however, their meaning is substantively different. Patient-centricity was meant to empower patients, addressing their care needs comprehensively, overcoming the disease-centered approach that Western medicine has taken in the past century. More recently, the concept of person-centered care claims that patients are first and foremost persons, with their personal needs but also their set of values, cultures and opinions that contribute to the concept of care. Finally, human-centered care is a lesser-used term but aspires to move beyond the individualistic view of care to prioritize all individuals' fundamental needs and values, focusing on plurality and intragenerational equity. Design has witnessed the same path from user-centered to humanity-centered and can provide tools to include those new principles in practice.

Sustainability in healthcare. This approach cuts across different healthcare disciplines, from public health to specific medical disciplines. It involves a range of theories and initiatives that aim to include environmental issues within healthcare practice. In most cases, professionals experiment with innovations to optimize energy and water and reduce waste in their routines. Despite the pragmatic value of these experiments, a holistic view of sustainability is advocated but rarely deployed. Design education can underpin systemic knowledge acquisition to design broad, cross-cutting strategies that make environmental sustainability an intrinsic aspect of medical practice and healthcare management.

Climate-smart healthcare. Under this umbrella falls research promoting an integrated use of digital technologies by bridging digital and ecological transitions in healthcare.

Computational technologies and, in general, all e-health strategies are radically changing the health sector. No discipline is fully prepared to address the consequences of the Digital Age. Design is building new skills and trying to understand the consequences of its practice. From this perspective, design education can investigate the implications of digital technologies on health in an interdisciplinary way. Connecting digital transition and sustainable healthcare is a desirable but still far-off step.

References

Atun, R. (2012). Health systems, systems thinking and innovation, *Health Policy and Planning*, 27, 4, October 2012, Pages iv4–iv8, https://doi.org/10.1093/heapol/czs088

Boehnert, J., Sinclair, M., & Dewberry, E. (2022). Sustainable and Responsible Design Education: Tensions in Transitions. *Sustainability (Switzerland), 14* (11), 6397. https://doi.org/10.3390/su14116397

Davis, M. (2017). *Teaching Design: A Guide to Curriculum and Pedagogy for College Design Faculty and Teachers Who Use Design in Their Classrooms*. New York: Allworth Press.

Davis, M., & Dubberly, H. (2023). Rethinking Design Education. *She Ji: The Journal of Design, Economics, and Innovation*, *9* (2), 97–116. https://doi.org/10.1016/j.sheji.2023.04.003

Dorst, K. (2011). The core of 'design thinking' and its application. *Design Studies*, *32* (6), 521-532. https://doi.org/10.1016/j.destud.2011.07.006

Dubberly, H., & Pangaro, P. (2019). *Making sense in the data economy*. AIGA Design Futures. Available at: https://www.dubberly.com/articles/making-sense-in-the-data-economy.html

Frascara, J. (2020). Design Education, Training, and the Broad Picture: Eight Experts Respond to a Few Questions. *She Ji: The Journal of Design, Economics, and Innovation, 6* (1), 106–117. https://doi.org/10.1016/j.sheji.2019.12.003

Herbert, C., & Best, A. (2011). It's a matter of values: partnership for innovative change, *Healthcare Papers*, 2, 31-37. https://doi.org/10.12927/hcpap.2011.22436

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. https://doi.org/10.1016/j.sheji.2019.12.002

Noel, L.-A., Ruiz, A., van Amstel, F. M. C., Udoewa, V., Verma, N., Botchway, N. K., Lodaya, A., & Agrawal, S. (2023). Pluriversal Futures for Design Education. *She Ji: The Journal of Design, Economics, and Innovation*, *9* (2), 179–196. https://doi.org/10.1016/j.sheji.2023.04.002

Pereno, A., & Eriksson, D. (2020). A multi-stakeholder perspective on sustainable healthcare: From 2030 onwards. *Futures*, *122*, 102605. https://doi.org/10.1016/j.futures.2020.102605

Pontis, S., & Van Der Waarde, K. (2020). Looking for Alternatives: Challenging Assumptions in Design Education. *She Ji: The Journal of Design, Economics, and Innovation*, *6* (2), 228-253. https://doi.org/10.1016/j.sheji.2020.05.005

Rusoja, E., Haynie, D., Sievers, J., ..., & Williams, B. (2018). Thinking about complexity in health: A systematic review of the key systems thinking and complexity ideas in health. *Journal of evaluation in clinical practice*, *24* (3), 600–606. https://doi.org/10.1111/jep.12856

Vink, J. (2023). Embodied, Everyday Systemic Design – A Pragmatist Perspective. *Design Issues*, *39* (4), 35–48. https://doi.org/10.1162/desi_a_00731

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Acknowledgment

The results of this paper come from research projects that received European funds: *Systemic Design and Sustainable Healthcare for MedTech Manufacturing* (SysteMA) project

was funded by EIT Manufacturing (id. 22111); *A Systemic Design approach to education and training on Sustainable Healthcare* (DesHealth) project was funded by Erasmus+ Programme (agreement n. 2023-1-IT02-KA220-HED-000157600).