Editorial Letter

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Dossier 19: Methodology in Design, Engineering, Product Design, Textile Materials, and Education

Solving complex problems in our society has promoted the continuous and systematic integration of diverse areas and fields of knowledge. As early as 1916, authors such as Herbert A. Simon coined the term “artificial sciences” to designate the knowledge produced in the fields of Engineering, Materials, Computing, Education, and Design (Simon, 1916). In his work, the author emphasized the role of these sciences in the creation of products and in the production of knowledge about the design process itself.

Increasingly, due to advances in technology and communications since the second half of the 20th century, society has demanded the integration of a multidisciplinary focus on “sustainability” into the technical curricula of university programs. This focus aims to solve complex problems in some fields such as Engineering, Materials, Computing, Education, and Design. In light of this complex scenario, transdisciplinary methodologies that bring together Engineering and Design, as well as Education and Design, have been widely adopted.

Design and Engineering have always been closely linked in practice, collaborating in both the creative exploration and the physical construction of objects, as well as in the production, testing, and validation of products. Design, in particular, draws on the knowledge base of Engineering and engages with various theoretical and practical disciplines—such as Medicine, Marketing, Sales, and Business. In this sense, Design encompasses a wide range of strategies for creating artifacts, including aesthetic design, form definition, prototyping, materials and structures, human factors application and testing, and contextual investigation methods.

In the context of textile materials, design methodologies play a prominent role, especially when technology is integrated into the creative process. This is particularly true in the development of smart textiles, technical textiles, biomedical textiles, and in the application of techniques like origami. Furthermore, Design's role in numerical modelling and simulation studies provide as an essential tool for Textile

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Engineering, enabling the design, calculation, and evaluation of applications before they are physically realized.

Design and Engineering education has been significantly transformed by integrating methodologies from diverse fields. Coupled with interactive and participatory approaches, this integration positions students as active participants in the educational process. This enhanced engagement boosts their potential for developing critical thinking and the practical skills necessary to meet contemporary challenges. These approaches, which emphasize the diversification and integration of knowledge, are crucial for preparing undergraduates for industry and research. They help develop autonomous and inquisitive individuals capable of tackling complex real-world problems, empowering them to design innovative, technological products and generate knowledge about their creations.

In the specialized literature, discussions can feature various methodologies, with an emphasis on Problem-Based Learning (PBL) and Project-Based Learning (PjBL), which integrate diverse teaching strategies into problem-solving and project-based frameworks (Moreira and Marques, 2025). In engineering, curricula are also being developed to incorporate Science, Technology, Engineering, and Mathematics (STEM) to address real-world technological problems collectively. Nonetheless, inquiry — and design-based learning approaches continue to span in educational settings (Fan, Yu, and Lin, 2021). Given this vast theoretical framework — in the midst of the evident evolution of teaching methods and proposals for integrating methodologies across design, engineering, product design, sustainability, textile materials, and everyday education practices — we propose this Dossier, its content is divided into four major sections, which reflect on:

1. *Design Theory and Methodology*. The works in this section comprise a journey through conceptual and philosophical approaches to design practices and systemic processes. They offer critiques oriented toward the project development process and its implications for design activity, both from the perspective of applying methodologies and reflecting upon them. The selected collection of works therefore, addresses:

1.1. Methodological meta-approach to Design Thinking on a professional

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master's degree in design: experience report.

1.2. Mood boards and the Atlas Mnemosyne: possible methodological approaches.

1.3. Fashion product design and design practices in the circular economy: sustainability and material culture in everyday consumption.

2. Design Education. This section presents works that predominantly discuss the teaching and learning of design, addressing issues concerning pedagogy, didactics, and the structure of courses and curricula. The central focus of these discussions lies in the process of transmitting technical skills, in the critical and sensitive development of the student, and in their preparation for professional practice. The featured works, therefore, navigate the intersections of transdisciplinary education, memory, and culture. Their themes are developed in the following articles:

2.1. Transdisciplinary methodologies for cultural sustainability in Fashion Design.

2.2. Graphic memory and design training: local culture in design practice in basic disciplines.

3. Digital Design Methods. The third session proposes a critical examination of the limitations and challenges inherent to the digital tools, technologies, and processes used in the design, development, prototyping, and manufacturing of products. Particular emphasis is placed on a) 3D modelling (CAD: Computer-Aided Design), b) digital fabrication (e.g., 3D printing), and c) the application of Artificial Intelligence (AI). The selected articles discuss the role of AI in creative processes, highlighting its current impact on human artistic creativity and its integration into design methodologies. Furthermore, they present 3D printing as a transformative technology within the fashion industry, one that promotes innovation and sustainability. The articles proposed for this session are:

3.1. Comparative aesthetic analysis of costumes created by artists and by AI in super heroine comics.

3.2. Additive manufacturing and the new approach to Fashion: innovation

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and sustainability in the textile industry.

4. Textile Materials and Textile Product Design Engineering. This fourth and final section presents proposals that adopt an interdisciplinary approach, integrating knowledge of textile materials with textile and product design. The unifying focus of the approaches in this section is to present discussions aimed at merging methodologies from textile design, product design, engineering, and materials science, with the ultimate objective of product development. Consequently, the articles that seek to achieve this goal address the development, characterization, and application of textile materials—including fibres, yarns, fabrics, knits, and nonwovens—in products designed to meet functional, aesthetic, comfort, and sustainability requirements. The works that comprise this dossier are as follows:

4.1. Characterization of regular polyamide 6.6 and biodegradable polyamide 6.6.

4.2. Surface design and sustainability: strategies for reducing environmental impacts in textile printing.

4.3. Alternatives of reusing an Amazonian vegetal fiber through a material-driven design methodology.

4.4. Design Science Research of weft-knitting spacer project for users with genodermatoses.

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This dossier represents an endeavor to contribute to the scientific discourse within the fields of Design Methodology, Engineering, Product Design, Textile Materials, and Education. To this end, Design Methodology has been adopted as the foundational framework guiding this work, as it is the discipline historically dedicated to the study and application of systematic methods for addressing complex, concrete problems. It is our contention that this dossier provides a concise and necessary overview of the application of the discussed methodologies and their relationship to educational practices. In summary, we invite readers to consider the following with us:

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> This is a design problem: how should machines be conceived so that their recoil does not cause us pain? Or, more precisely: how should these machines be designed so that their recoil is beneficial to us? How should the stone jackals be designed so that they do not tear us to shreds, and so that we ourselves do not behave like jackals? Naturally, we can design them to lick us rather than bite us. But do we truly wish to be licked? These are difficult questions, for no one truly knows how they want to be. Nevertheless, we must debate these questions before we begin designing stone jackals (or perhaps clones of invertebrates or bacterial chimeras). And these questions are far more intriguing than any stone jackal or any future superhuman. Will the designer be prepared to pose them? (Flusser, 2007, p. 49-50) (**Authors' translation**).

Finally, we extend our sincere gratitude to all the guest reviewers who meticulously examined the manuscripts for this issue. Their work, though a voluntary undertaking that demands considerable time, provides invaluable intellectual contribution. We also wish to thank the editorial team of *Revista de Ensino em Artes, Moda e Design* for their dedication and effort in producing this publication. Lastly, we are grateful to the authors whose scholarship and contributions were essential to the completion of this project. To everyone involved, we express our profound appreciation.

We wish you an engaging read[1].

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