Chapter 3
Bio-Informed Design Thinking Through Problem-Based Approach:
An Architectural Point of View

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ABSTRACT

Bio-informed design focuses on transferring biological knowledge to different disciplines through analysis, interpretation, and abstraction. This approach, which can also be used in education, is essential in terms of showing students the knowledge and potential of nature. In this way, students have the opportunity to examine the principles and strategies of nature for the design problem, they are informed, and they can transfer the knowledge they have acquired to an innovative design concept. In this context, this section includes problem-based studies carried out with students within the scope of a postgraduate course in the Gazi University Architecture Program in the 2020-2021 spring semester. Students' experiences of establishing a relationship between nature and architecture and transferring knowledge from nature to architecture were observed with the application. With the study, the importance of disseminating the bio-information-based design approach and directing individuals to nature for innovation and sustainability has been emphasized once again.

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INTRODUCTION

Humans have been inspired by nature to solve their problems for more than 3000 years (Vincent et al., 2006). Because nature has developed an infinite variety of structures, systems, and materials. Understanding and interpreting the principles at their core enables technological advances through bio-informed design (Dixit & Stefańska, 2022). These concepts, such as Bio-informed/Biomimicry/Biomimetics/ Bionic/Bio-inspired/Bio-focused/Biomimesis, whose main theme is "nature," can be interpreted as an approach, method, tool, discipline, or strategy. Despite their philosophical differences, all these terms essentially mean "designing by learning from the best ideas of nature" (Benyus, 2002).

The bio-informed approach draws information from "nature," which has a long history and inventory of data, to find solutions to design problems. Bio-informed research for this purpose aims to transfer the acquired knowledge to the design process by making use of biology terminology. This transfer occurs as interpretation, learning, and derivation from living nature rather than copying, offering different possibilities within the design process.

Today, the bio-informed approach is an important emerging research area in fields such as design, engineering, and robotics, aiming to use biological knowledge systematically to solve design problems (Stone, Goel & McAdams, 2014). Similarly, using the bio-informed approach as a creative and innovative technique in architectural education is constantly evolving (Amer, 2019). The "bio-informed approach," which can be used as a tool for design, is also incorporated into educational practices and programs.

The concept of bio-informed holds significant potential for problem-solving by providing sustainable and innovative ideas to students studying in the architecture department, both in their education and professional lives. Nature-based architectural learning explores nature's process cycles, designs, and potentials (Mutlu Avinç, 2022). However, this methodology, which is based on collaborative/interactive/creative methods, is one of today's most important research topics that can be integrated with contemporary educational approaches (Arslan Selçuk & Mutlu Avinç, 2022).

In this context, seeking sustainable solutions to design problems by learning from nature for a sustainable future is one of the innovative approaches that should be supported in design education. However, influential travel between the fields of architectural design and biology is seen as a significant gap that needs to be addressed as it establishes connections that facilitate innovative design and increase the cognitive creativity, flexibility, and adaptive problem-solving skills of architecture students. In this regard, Lily Urmann states that the bio-informed design approach is "a unique and powerful way to think and learn about sustainability" (Urmann, 2016). She also argues that this approach affects how we solve problems and design

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