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Biomimicry Sketch Analysis: A Generative Tool for Sustainability in Product Design Education

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Janine Benyus introduces the term in her book entitled, "*Biomimicry*: Innovation Inspired by Nature" in 1997. Benyus describes *biomimicry* through three steps, which are nature as model, measure and mentor. It has become an innovative approach for the product design and development process, which encourages sustainable solutions through learning from nature's models, systems, processes and elements. *Biomimicry* has the potential to explore and understand the tenets of sustainability; however current idea generation tools are not mainly tailored to designers' needs in integrating this approach into the design process for sustainability.

In this paper, a generative tool for *biomimicry* will be presented within the context of an educational project. To explore the implications of it for sustainability, conclusions from and insights into a graduate research will be presented. The primary emphasis of this research is on the implications of *biomimicry* for the idea generation phase to help the design students develop evolving, sustainable products. The educational project was carried out in the Department of Industrial Design in Fall 2011, which was undertaken in collaboration with one of the major bathroom products and accessories producers in Turkey. Within the scope of this project, *a family of products* was developed through rethinking and reintegrating ceramic bathroom accessories (e.g. soap dish holders, toothbrush holders, towel bars, etc.) with bathroom tiles. In this project, the students explored the implications of *biomimicry* strategies for the sustainable design considerations (i.e. product maintenance, repair, upgrading and personalization) to bring together bathroom accessories and tiles.

The examples demonstrating nature's "knowledge" or ways of doing things were incorporated into the project through *biomimicry* sketch analysis, a generative tool, which was specifically developed for the design students within the context of the educational project. For this analysis, the students observed, explored and documented three different natural systems or organisms (e.g. animals, insects, plants, trees, seeds, etc.) that they found inspiring within their nearby environment (e.g. campus, botanical garden, zoo, lake, etc.). In this assignment, the students were expected to explore and analyze at least the first two of the following strategies: **attach and detach**: permanent or temporary; **adapt**: optimize space or materials, change form, color or position; and an optional one: (self-) clean, etc. For each natural system or organism, they prepared a detailed hand sketch analysis which described and visualized the following aspects:

- **The source of inspiration:** visual representation of the model or system learned from nature
- **Its unique feature(s) and component(s)** in terms of the strategies;
- **The implications of the feature(s)** for this particular design project in terms of form, color, pattern, assembly, modularity, diversity, scale, etc. to transfer these features into initial design solutions.

This paper presents the outcomes from the *biomimicry* sketch analysis and semi-structured interviews with the design students, and insights into the following areas of research, which are the integration of *biomimicry* into the early stages of the design process and the implications of this approach for better understanding and incorporating the sustainability considerations.