

First Year Engineering Design Idea Generation with Design Heuristics

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Abstract - The 77 cards: Design Heuristics for Inspiring Ideas is a tool that can be used to support students in generating more diverse and creative ideas in their product designs. This workshop will introduce participants to this research-grounded ideation tool and provide multiple lesson versions for integration into capstone courses to support students in developing innovative ideas. Students often have difficulty generating multiple creative ideas for design problems. “Design Heuristics” is an empirically derived and validated approach to product design ideation; our research has shown that concepts created by engineering students who used Design Heuristics were more complex, creative designs. This workshop will include a review of relevant research on idea generation and an introduction to this research-grounded creativity tool. Participants will practice using the Design Heuristics to generate concepts for design tasks and discuss ways to implement it effectively in their classrooms.

Index Terms – Design Heuristics, Creative Idea Generation, Engineering Design

PURPOSE, OBJECTIVES, CONTENT, ACTIVITIES, OUTCOMES

Our learning goals for participants in this session are to:

- Assist them in recognizing struggles students have with creative idea generation
- Teach them how to use Design Heuristics to aid idea generation
- Help them plan the integration of Design Heuristics into their own courses.

Our workforce must be capable of innovation to face the Grand Challenges in Engineering of the 21st Century. However, instructors find it difficult to teach students to “think innovatively” because of the lack of instructional methods and limited time within the curriculum. Creative thinking during idea generation in design work has been traced to successful innovations, thus techniques to support creative conceptual design are imperative in engineering. While instructors might encourage students to “brainstorm” by generating many ideas, limiting evaluation, and allowing “wild” ideas to emerge, these suggestions do not provide

students with specific, systematic ways to generate creative designs.

There are a variety of proposed methods for idea generation, however, only one has been systematically derived from the analysis of engineers’ design processes and empirically validated in classroom and industry settings: Design Heuristics. Design Heuristics are prompts that facilitate and guide design space exploration during concept generation by helping designers initiate new ideas from scratch or transform existing ideas into new solutions. A single Design Heuristic can produce a variety of designs depending on how it is applied within a problem. The application of Design Heuristics can provide engineering students with a specific method for generating more creative, and more diverse, solutions to design problems.

Each Design Heuristic has been represented on a card to facilitate their use. Each card includes a description of the heuristic, an abstract image depicting the application of the heuristic, and two product examples that show how the heuristic is evident in existing consumer products.

In this workshop session, our goal is to help participants recognize struggles students have with creative idea generation, teach them how to use Design Heuristics to aid instruction on idea generation, and help them plan ways of integrating this tool into their own courses. Activities will include discussions on idea generation and research supporting what successful idea generation looks like, practicing concept generation with partners and in teams, and working on design ideation tasks (with and without the cards).



FIGURE 1
DESIGN HEURISTIC CARD EXAMPLE (FRONT AND BACK OF CARD).

FACILITATION PLAN

This 90 minute session will involve a formal presentation and interactive tasks interspersed throughout the session. Approximately 25 minutes will include discussion of processes of idea generation in design, challenges students face in generating creative ideas, introduction to the Design Heuristics and how they were developed, and an overview of models for integration of the Design Heuristics into first year engineering courses. Approximately 60 minutes will be devoted to interactive tasks. These include idea generation tasks with and without the Design Heuristics tool (both to initiate and transform ideas) as well partner and whole-workshop discussions on strategies to generate ideas, approaches with the Design Heuristics, and integration of the tool into first year engineering courses.

Participants can view the Design Heuristics website (www.DesignHeuristics.com) and view a lesson and relevant publications. Participants will be informed of the C2Gen programme, an online course program that has a unit on idea generation and Design Heuristics. We will also offer support for any instructors planning to use the tool in their courses.

AUTHOR INFORMATION

If your workshop has multiple authors, use this section to list author information.

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