Design Signatures in the Wild: Making the Invisible Visible (in First Year Engineering) WORKSHOP

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Introduction

In addition to learning about and experiencing the engineering design process, a learning outcome of most first year engineering programs is to develop students' awareness of the design process itself. This can be difficult since engineering students, especially novices, often focus on the design deliverables as tasks rather than artifacts of an ongoing process. This workshop engages with the question: How might we help students become better able to intentionally engage in a design process, as part of an effort to help them become reflective practitioners [1] of design? One answer to this question revolves around the idea of "Design Signatures" [2], both a concept and a tool for representing and reflecting on a design process.

The group of design educators leading this workshop have experience using Design Signatures to teach undergraduate engineering students across a diverse set of institutions about design processes, from first-year students to graduate students. We have used Design Signatures in a variety of ways ranging from short, in-class activities to longer efforts where seniors track their capstone projects. We have collected signatures using paper-and-pencil bubble sheets, Google forms, spreadsheets, and a newly-developed Design Signatures app. In each implementation students have had great "aha" moments about the design process and themselves as designers. For example, students have said:

> "I enjoyed the visualization of my project progress; it was very helpful to see how the project fleshed out as it did while also giving form to how it did." [First-year student]

> "[Tracking our progress] kept us present and reminded us of phases that we needed to revisit or had forgotten." [First-year student]

We are enthusiastic about sharing these inspirational activities with our colleagues and empowering first year engineering educators to equip their students with the tools to adopt a reflective design practice from the beginning of their academic careers.

Anticipated Audience

We expect this workshop to be of interest to first year engineering educators and researchers, especially those who research the design process, teach the design process, or engage in the design process themselves. We also expect this workshop to be of broader interest to first year educators who incorporate mindful practices in their courses or are interested in developing self-awareness in students as an effort to educate whole people. The main emphasis will be on strategies to develop a reflective design process, including equipping participants with tools to track and reflect on the design process. We will also discuss ways to encourage and support first year students to develop these design awareness skills.

Workshop Goals

The intent of this workshop is to teach participants how to build self-awareness for their students and themselves through self-tracked design timelines (Design Signatures). With these Design Signatures visible in front of them, students and faculty can better reflect on an otherwise invisible design process.

At the end of this workshop, participants will…
- have confidence to run classroom activities where students self-create Design Signatures,
- feel energized about the impact of Design Signatures on student learning about design,
- be able to make a concrete connection between Design Signatures and their own teaching/practice,
- have a set of tools to track design processes that they can use in their classrooms,
- be able to explain the foundations of the design research underlying this work,
- feel connected to the broader first-year engineering, design education, and Design Signatures community,
- know where to find resources to support the implementation of Design Signatures with their own students.

Significance
On a theoretical level, this work connects to the diversity of design processes (e.g., [3]) and research on metacognition (e.g., [4], [5], [6], [7]). This workshop also builds on prior research on helping students to become more metacognitively aware of their current state in a design process [8], [9] and on research on design timelines and representations [2]. These design timelines offer a unique approach to promote design reflection in classrooms grounded in engineering education design research. In addition to using these tools to study the design process, we are working as educators to support students to track and reflect on their own design processes.

The Design Signatures "in the Wild" community, currently composed of 12 educators and researchers across 7 institutions, has been exploring the use of Design Signatures to teach design since January, 2023. We are also giving versions of this workshop at other engineering education conferences this year. By sharing these resources widely, we hope to support our goal of developing a community of reflective design practitioners and educators.

Workshop Summary and Outline
Over the course of this 90 minute workshop, participants will explore the idea of Design Signatures from different perspectives. First, we will put on our "researcher hats" to trace the development of this idea through a long history of design education research. Next, participants will put on their "designer hats" to experience what it's like to track the design process using tools developed by the presenters. Finally, participants will put on their "design educator" hats to think about how the concept of Design Signatures and the associated tools and strategies could be implemented in their own first year context.

Outline

Introduction	We will provide an overview of the research context underlying Design signatures and introduce the presenters as a working group
Hands-On Learning	We will provide participants with an opportunity to interact with Design Signatures directly. For example: Participants will develop new Design Signatures using synchronous coding of a recorded design activity
Implementation	We will discuss example implementations of Design Signatures to different course contexts and help participants make connections to their own courses.
Wrap-Up	We will recap the key workshop points and invite participants to join follow-up sessions after the conference.

References

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