

# Special session:

## Put me in coach! Developing a design playbook for instructors to help engineering students do design

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**Abstract** – Those instructors charged with teaching design-oriented and design project courses oftentimes depend on their own professional judgement and experiences to provide guidance and feedback to young undergraduate and computing students. However, most are not trained as teachers per se. This special session will provide opportunities for participants to share their experiences, reflect, and contribute to a “playbook” of teaching and design coaching “moves” to help students navigate the oftentimes ambiguous learning experiences associated with design activities. The special session provides for a lot of participant engagement, interaction, and role playing. Results from this special session will be reflected back to our intellectual community in a future FIE paper.

**Index Terms** – design education, design thinking, faculty development

### ON DESIGN COACHING

This special session will focus on design coaching. It will tackle a need in our community to develop, share, and refine teaching resources for instructors to coach undergraduate engineering and computing students through often amorphous and unstructured design learning experiences as are found in capstone engineering and computing courses. We seek to share our prototype of a playbook of teaching “moves” such as relevant and useful reflective prompts, case stories, and other guidance in mindfulness in expertise in how one might coach a design team.

### SESSION GOALS

For our session goals, participants will:

- Commiserate and share their frustrations/pain points with barriers students experience in their culminating design capstone experiences.
- Work collaboratively to co-design/identify teaching strategies to manage common barriers.
- Apply teaching “moves” in an engaging and fun role-playing approach using improvisational theater activities.
- Leverage our prototype of a design playbook to practice, help test its efficacy (and provide feedback for our team).

- Leave enlightened and informed about how such a shared resource could help their design coaching and teaching.

### AUDIENCE

The intended audience are faculty who teach design-oriented classes and have colleagues who teach capstone engineering and computing courses and/or project-based learning courses with a strong design element. We imagine this as an aid to the wide array of types of instructors who are asked to mentor student teams. These may be adjunct faculty or professors of practice with a wealth of experience as professional engineers but wanting additional guidance to support the shared learning enterprise. This is also of potential interest to all faculty who wish to bring in design-oriented activities and projects to any of their courses.

### NOVELTY OF SESSION AND MODES OF INTERACTION

For our context, culminating capstone engineering design and computing courses are well established within undergraduate engineering and computing curricula. Students are expected to synthesize their engineering or computing content knowledge and be able to successfully transfer their educational experiences to solving an authentic engineering or computing problem, often connected to a local company’s context. But oftentimes course instructors may be focused on the product of the class experience – a prototype or a testing apparatus – prized over the educational aspect. This special session is novel in that we will use the experience and expertise of participants to explore the learning part of the experience – of the process of design and design learning.

We expect to use our time to mostly engage participants in active discussion, reflection, and documentation throughout.

### SESSION TOPICS

This work builds on a research to practice model of related knowledge of students’ supports and barriers to doing design work as well as experiences across multiple institutions in teaching design, design thinking, and creativity in engineering education. There are countless opportunities for students to get mired in many aspects of their capstone experience. We will leverage the Informed Design Learning

and Teaching Matrix [1], a reflective tool that identifies a number of patterns that highlight tensions across a novice-expert spectrum of behaviors for design praxis:

- Problem Solving vs. Problem Framing
- Skipping vs. Doing Research
- Idea Scarcity vs. Idea Fluency
- Surface vs. Deep Drawing & Modeling
- Ignore vs. Balance Benefits & Tradeoffs
- Confounded vs. Valid Tests & Experiments
- Unfocused vs. Diagnostic Troubleshooting
- Haphazard or Linear vs. Managed & Iterative Designing
- Tacit vs. Reflective Design Thinking

From related research in observing student teams, we can also identify problematic affective issues such as an overabundance of ambiguity, unstructured or under-structured problem definition, resetting the problem space, paralysis of inaction, technology as a panacea, and teaming.

Additionally, several themes have arisen as supports to the students successfully adapting a design thinking and prototyping culture as catalysts for student learning [2]. They are facilitated by a *situative zeitgeist* – a close proximity to other groups in a shared design space (physical or virtual), *scaffolded prototyping* – a series of front-loaded prototype milestone assignments, *cognitive iteration* – a practice of encouraging reflection on what is gained from prototyping, and *cognitive apprenticeship* – learning aided by repeatedly stepping through the steps of the design process [3]. These practices and local customs improve the students' learning experiences.

#### SESSION AGENDA AND EXPECTED INTERACTIONS

For our session agenda, our plan is divided up as follows:

1. Introduction (5 minutes) – briefly introduce the concept of a set of resources to help with design coaching
2. Shared Team Design Experience (10 minutes) – creative design task (newspaper tower build) to give an experiential basis for discussion
3. Brainstorm (5 minutes) - ways your students get stuck - come up with a scene that creates that situations, others experience
4. Introduce (5 minutes) “Informed Design Learning and Teaching Matrix” [1] summary with associated teaching “moves”
5. “Theater of the Oppressed” [4] improvisational theater activity (35 minutes) with role-playing where “students” get stuck and workshop participants are invited to play-

act to jump into a scenario. This allows participants to enact what one might do (as opposed to just saying it). This is deployed as a reflection and synthesis exercise with an invitation prompt of “what would you do?” This is engaging and performative – we present the problem and participants come up with the moves to address these. There will be multiple vignettes/charrettes with multiple iterations and interactions within each. There will be a cycle of doing and debriefing about what are ways we coach and what we can draw from.

6. Design playbook feedback (10 minutes)
7. Session debrief with reflection (10 minutes) about what one may try to take it home.

#### EXPECTED OUTCOME

The expected outcome of this session is that participants will gain tools to help their teaching and that we can test and get feedback on our design playbook concept and approach. We expect that we will report on the session in a follow up FIE paper next year.

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