

Feedback in concept development: Comparing design disciplines



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Design feedback is an essential pedagogical tool to promote student design progress, yet little research has focused on what instructor feedback looks like, especially across design disciplines. In this paper, we analyzed feedback provided in dance choreography, industrial design, and mechanical engineering to explore variation in feedback type across disciplines as well as how feedback type encouraged students to take convergent or divergent paths in their design processes. Many common feedback types were observed across the three disciplines, regardless of variance in context and expectations, as well as some notable distinctions. With regards to feedback directing convergent and divergent thinking, feedback suggesting convergent pathways was more prominent across all three disciplines.

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Innovative solutions are often traced to ideation, where diverse creative ideas are initiated and developed (Brophy, 2001; Liu, Bligh, & Chakrabarti, 2003). Design processes facilitate this route to bringing ideas to innovative outcomes (Ottosson, 2001; Soosay & Hyland, 2004), and this path toward innovation hinges on successful concept generation, defined as the creation of multiple and diverse concepts (Akin & Lin, 1995; Atman, Chimka, Bursic, & Nachtman, 1999; Daly, Yilmaz, Christian, Seifert, & Gonzalez, 2012; Liu et al., 2003). Students often engage in design ideation during project-based courses such as cornerstone and capstone engineering design courses and domain-specific and interdisciplinary studio courses (Dym & Little, 2004; Oh, Ishizaki, Gross, & Do, 2012; Sagun, Demirkan, & Goktepe, 2001; Uluoglu, 2000). Project-based courses often allow for more freedom in timing and pathways, but instructors must make sure students stay on track. Instructor success relies, in part, on the ability to provide guidance and feedback on students' design paths and processes, allowing them to explore on their own, but facilitating a structure where the students can learn strategies to fully explore and define problems, engage in

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divergent processes by generating a wide range of solutions and converge on and verify the most promising outcomes.

In our work, we investigated instructor feedback in dance choreography, industrial design, and mechanical engineering to compare instructors' approaches to guiding students' work. While the content of the design projects was unique to the disciplines, students engaged in design thinking, as they were responsible for generating, evaluating, and developing ideas into a final design outcome. *Our goal was to compare feedback settings and types across disciplines and understand how instructors used feedback to suggest thinking pathways* (convergent or divergent) as ideas were created and developed, or did not direct students to either way of thought. By exploring feedback across disciplinary contexts, we aimed to understand disciplinary similarities and differences as well as provide a means to share coaching strategies across disciplinary boundaries.

1 Design education across design disciplines

Design is not associated with a single discipline or domain of knowledge in definitions or descriptions of design (Daly, 2008). Many disciplines engage in design thinking, even though they may each use unique language to describe it (Goel & Pirolli, 1992). There is considerable overlap in the work performed by choreographers (dance designers), engineering designers, and industrial designers as they are all engaged in design thinking in their iterative design processes. Design literature supports a broad range of disciplines in discussions of designers. For example, Nelson and Stolterman (2003) include architecture, educational design, engineering, industrial design, information design, instructional design, organizational design, software design, and urban design, and Zimring and Craig (2001) include architecture, computer science, engineering, industrial design, and the performing arts. Studies on design with multiple disciplinary design perspectives can provide rich results that allow for design disciplines to learn from each other (e.g., Cross & Roozenburg, 1992; Daly, 2008; Daly, Adams, & Bodner, 2012; Goldschmidt & Rodgers, 2013; Lloyd & Scott, 1994; Purcell & Gero, 1996; Yilmaz, Daly, Seifert, & Gonzalez, 2010, 2015).

Dance choreography is an act of combining elements to form a whole and translating ideas into artifacts (Schiphorst, Calvert, Lee, Welman, & Gaudet, 1990) and the design process is seen as a way of explicating and of modeling and expanding potential ways of thinking about making art (Schiphorst, 1989). In composing a new dance, a choreographer starts from a particular stimulus within a context or an event, and explores or develops the generative idea, or interprets the music or the narrative through movements that successfully reflect the theme (Lee, 1988). Choreographers are often engaged in a balance of imagination and analysis to produce 'something'

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