Research Project Title: Structural Engineering in the Workplace: How Practicing Engineers Represent Fundamental Structural Engineering Concepts

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Abstract:

Engineering concepts are represented in a variety of contexts by practicing engineers in their daily work. In structural engineering, these contexts include material items, such as codes, software, and drawings, as well as social interactions with mentors, teams, and architects. Situated cognition theory posits that these contexts influence the ways in which engineering concepts are represented and understood amongst engineers. The purpose of this research is to explore the social and material contexts of a structural engineering workplace to better understand the ways in which structural engineers represent fundamental structural engineering concepts. This exploration was conducted using ethnographic methods over three months at a private structural engineering firm. The researcher worked as a part-time intern with the firm over these three months while observing engineers in their everyday work, interviewing engineers, and documenting the artifacts that engineers use regularly. These observations, interviews, and artifact collection focused on identifying structural engineering concepts and understanding their representations in structural engineering practice. Some of the main structural engineering concepts present in the workplace are load determination, load path, and design/analysis of structural members for flexure and shear demands. Structural engineers represent these concepts in a multitude of different ways depending on project constraints, but some staples include the use of codes and manuals, sketches of free body diagrams, product catalogs, and structural drawings. These representations are used to aid in the design process and discuss structural engineering concepts amongst other structural engineers and architects. Structural engineers must navigate and synthesize multiple different conceptual representations in their daily work. To best prepare structural engineering students for their careers, curriculum can provide greater exposure to the conceptual representations common in the workplace. One potential area for improvement could be integrating more structural drawings and codes into design courses so students are more exposed to where loads come from and how they flow through a structure.

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