2024 TIP Winner
Digital Sandbox for Experiential Model-Based Engineering Education

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A Construction Engineering and Management (CEM) professional’s success depends on two key things:

- Their sound understanding of multiple engineering principles
- Their ability to visualize, understand, analyze, and communicate intricate interdependencies between disciplines involved in the design construction of civil infrastructure.

Such complexity is hard to replicate in classrooms making CEM a field where true learning allegedly only takes place “on the job” through years of field experience.

This project was motivated by the desire to challenge this status quo and explore methods to mimic construction field experience in classroom teaching.
What is the project?

- Digital Sandbox for Experiential Model-Based Engineering Education
  - Technologies rooted in Building Information Modeling (BIM)
  - Digital Twins enable simulation of real-world scenarios

- Classroom instructors can create teaching content and assessments of varying complexity suitable for students of all levels and backgrounds.

- The Digital Sandbox represents a “theater” within which instructors can stage any “play”.

- The experiential learning pedagogy has been introduced in multiple construction classes, extended to engineering and nursing labs at Michigan, and courses at other universities (Texas A&M, Stony Brook).

Image Credit: Walter P Moore (www.walterpmoore.com)
Outcomes

- **Gamified Learning** that fosters student engagement
- **Active Collaboration** that promotes interdisciplinary understanding
- **Augmented Reality (AR) and Virtual Reality (VR) Integration** that provides unique learning experiences
- **Open Educational Resources** that cultivate knowledge sharing
- **Project-Based Experiential Learning** with real-world projects

**IN ESSENCE, STUDENTS ARE TRANSPOSED TO ACTIVE, ALBEIT DIGITAL, CONSTRUCTION SITES AND THEY REMAIN IMMERSED THERE FOR THE DURATION OF THE SEMESTER**