Making a College-Level Multidisciplinary Design Program Effective and Understanding the Outcomes

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"It is long past time that we rip engineering education out of the lecture hall and place it instead in the discovery environment of the laboratory, the design studio, or the experiential environment of practice." (Duderstadt, 2008)

The Multidisciplinary Design Program

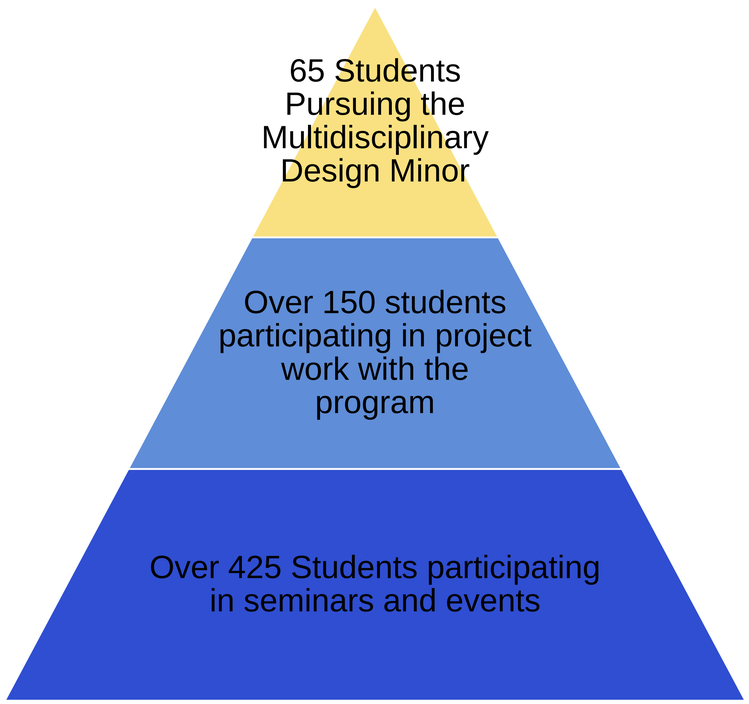
Goals of the Program

❖Addresses professional practice ("learning to be") through an experiential process of creative engineering in a multidisciplinary environment;

❖Promotes a broad spectrum of high quality experiential, multidisciplinary DBT opportunities that is sustainable and that engages other schools/colleges at Michigan as well as outside partners from industry, government, and other appropriate organizations;

❖Motivates and deepens the understanding of classroom acquired knowledge along with laying the foundation for the skills to be life-long learners.

Student Participation



Research Questions

- ❖ How do students with multi-disciplinary design practice talk about their experiences?
  - What advantages do they perceive?
  - What challenges do they encounter?
- ❖ How do students' conceptions compare to novices and more advanced practitioners in school and industry? What areas would we want to support additional growth?
- ❖ How do students' conceptions inform a larger set of questions that could be used to investigate differences between students who have these types of experiences and those who do not?

Research Methods

❖Semi-structured interviews contextualized in concrete experiences
- "Think about an experience you've had working on a design project with others from different disciplines."
- Students were asked to describe their experiences and approaches both to design and working with those from other disciplines.

❖Transcribed and analyzed using constant comparative methods (Lincoln and Guba, 1985)

Conclusions and Implications

❖Facilitating student reflection is central to maximizing student learning designing with others from multiple disciplinary perspectives.

❖ The MDE program improvements can be modeled from Kolb's Experiential Learning Cycle; central to students' experiential learning is the opportunity to reflect on experiences, relate those experiences to their understandings about design cross-disciplinary work, and experiment with new work strategies.

❖ Program improvements will include an MDE seminar course facilitating these aspects of Kolb's Experiential Learning Cycle.

Results

Iteration leading to improvement

Participants reported a broader understanding of the design experience from beginning to end. They recognized that the first design outcome is not necessarily the "end of the design, and they could learn something from the first attempt to improve their designs.

Awareness of the reality of failure

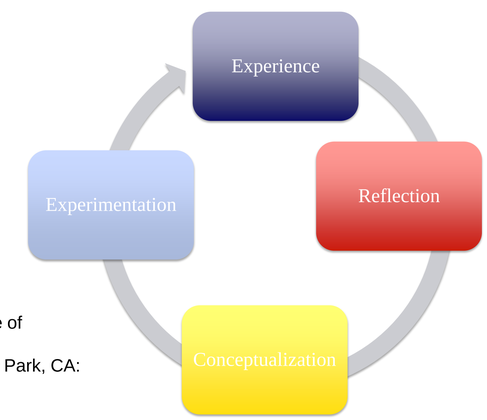
Failure existed in all of the students' multidisciplinary design experiences. The opportunity to fail in these contexts supported participants' awareness or the reality of failure, and transforming failure into learning opportunities, in design work.

Recognition of the need for multiple disciplines

The necessity of learning from other disciplines was evident to participants as a result of their MD experiences. They were challenged to cross disciplinary boundaries and recognized the importance of improving at these skills.

The value of testing for ultimate success

The time and context provided participants with the opportunity to create a working design with multiple attempts, whereas in the constraints of classes, this is often a limiting factor. They explained testing and iteration as an important aspect of a successful design strategy.



References
ASEE (2009). Creating a Culture for Engineering Education Innovation.
Duderstadt, J. (2008) *Engineering for a Changing World: The* Millennium Project.
Kolb, D.A. (1984): Experiential learning: experience as the source of learning and development, *Englewood Cliffs, NJ: Prentice Hall*
Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Newbury Park, CA: Sage.