TRANSFERABLE ASSESSMENTS FOR CAPSTONE ENGINEERING DESIGN

PROJECT SUMMARY

The goal of this project is to create a versatile system for reliable assessments of student learning outcomes for capstone design courses across engineering disciplines and institutions. Assessment tools will be developed by a multi-institution faculty team with input from a diverse set of expert consultants and stakeholders. Assessment instruments will be built around frequently used classroom assignments to measure achievement of high-level integrated performances in capstone design courses. Performance expectations will be derived from a profile of a top quality engineer for applicability to a full range of capstone engineering design courses. Developed assessment instruments will be tested for quality in diverse institutions and student populations to demonstrate their transferability.

Intellectual Merit

This project builds on a decade of engineering design education and assessment achievements of the Transferable Integrated Design Engineering Education (TIDEE) consortium in the Pacific Northwest. The investigators have engaged regional and national collaborators to: (a) develop a consensus profile of a top quality engineer[1], (b) define engineering design learning outcomes at mid-point and end-of-program[2], (c) develop and test reliable assessment instruments for engineering design[3], and (d) facilitate dozens of workshops to help faculty define and assess engineering design learning outcomes. Much of this work has been presented at national meetings, published in the *Journal of Engineering Education*, and published on the TIDEE web site: www.tidee.cea.wsu.edu.

A multi-institution Development Team will lead efforts in creating the assessment system, while drawing nationally from Project Consultants, an Implementation Team, and other academic and industry stakeholders for input, review, and testing. First, a comprehensive framework will be created for organizing assessment tools around learning outcomes for capstone design courses. Then requirements will be established for student performance criteria and operational features of assessment instruments for varied capstone courses. Three assessment instruments will be developed fully to measure a broad set of integrated performance outcomes. These assessments will be pre-tested by Development Team members and evaluated more extensively by the Implementation Team for reliability, validity, and operational acceptability. Results will be disseminated through presentations at regional and national conferences, a national workshop, the TIDEE web site, and academic journals. An assessment manual to support design texts will be produced for a commercial publisher.

Broader Impact

This project will produce assessment tools that benefit engineering degree programs across the US. All major engineering disciplines will have tested assessment tools applicable to them. Assessments will support success of diverse engineering students by removing assessment bias, measuring learning outcomes fitting varied career paths, and clarifying performance expectations. Assessment tools will help faculty to monitor and support improved student performance. Assessment results will be useful for documenting student achievement, as required for engineering program accreditation by the Accreditation Board for Engineering and Technology (ABET). Because capstone design learning outcomes are similar to those in many adult education fields, assessment tools developed in this project can become models for many other fields. Sound assessment models will increase the assessment literacy of engineering faculty. Cooperation among faculty and industry in this project will enhance understanding of one another's concerns and produce educational programs more responsive to the needs of society.

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[1] Profile of an Engineer. www.tidee.cea.wsu.edu/assets/engineer-profile.html.

[2] Davis, DC et al. 2003. "How Universal are Capstone Design Course Outcomes?" ASEE conference paper

[3] Davis, DC et al. 2002. "Practices for Quality Implementation of the TIDEE Design Team Readiness Assessment." ASEE conference paper

[4] McKenzie, LJ. 2002. "End-of-program assessment: An investigation of senior capstone design assessment practices." Doctoral Dissertation, College of Education, Washington State University, Pullman, WA.