

Using Metacognition to Teach Evaluation of Results in Structural Analysis Courses

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Project Abstract:

As the size and complexity of structural analysis problems increase, the potential for errors and the devastating impacts of errors increase. Currently, structural analysis courses and textbooks provide minimal coverage, if any, on how to evaluate the reasonableness of structural analysis results. Therefore, this project is developing prototype course materials for teaching evaluation of structural analysis results using metacognition. Metacognition is a sequence of steps followed by a person to monitor and improve that person's own cognitive performance in an area. Metacognition has been used to improve student learning in reading, math and science for over twenty years; however, the technique has not yet been widely used in engineering.

Dr. Hanson is interviewing expert structural engineers to document the cognitive strategies they use to successfully evaluate structural analysis results. The students receive instruction on the cognitive strategies and on metacognition. Metacognition allows the students to monitor their own decision making processes as they learn how to implement the cognitive strategies. Members of the Rose-Hulman Office of Assessment are conducting evaluation of student learning as independent observers. Learning is being measured during three iterations of the Structures I and Structures II courses: the first without formal instruction on metacognition and the two subsequent iterations with instruction.

The prototype course materials are being made available electronically so that instructors at other institutions can adopt the new format for the courses. Dr. Hanson is publishing the strategies used by expert engineers to allow practicing engineers to improve their knowledge base. The materials are also being disseminated to design firms for in-house training. In addition, these materials are being made available to instructors in order to introduce results evaluation in courses across all engineering disciplines.