

## Bridging the Gap Between a Classroom Innovation and an Educational Publication

Engineering education research is a growing research field. There is an ever-increasing availability of research on educational interventions designed to enhance student learning, retention, and success. Many of these papers concern a single activity (e.g., experiment, demo, or project) that was introduced into a specific course. Someone who's never published an educational paper may wonder—how does one take the step from a “neat idea” to a publishable paper?

Publications describing a specific pedagogical innovation have, in a broad sense, three essential elements:

1. *Background/literature review*
2. *Thorough description of innovation and setting in which it was used*
3. *Assessment of effect of innovation*

#1 should present comparable methods from the literature and frame how your innovation is unique. It should also explain why your activity is expected to be effective—for example, by explaining how it embodies accepted “best practice” teaching methods.

#2 is readily written once the innovation itself has been developed. In some cases documents like student handouts provide a starting point for writing the paper.

#3 can be integrated at least partially with the task of evaluating and grading students. Examples include:

- **Pre/post quizzes.** *Activities like lab experiments are often followed by graded quizzes. Presenting this quiz both before and after the activity means it can also be used to help assess what students learned.*
- **Comparison to control group.** *You can compare student performance to the performance of a control group. If you have taught the course previously, then the last cohort you taught prior to introducing the innovation represents a logical control group. Sometimes when courses are taught with multiple sections, the other sections can be used as a control group. The comparison can be conducted by looking at raw grades in the course, exam, or assignment, but these are often subject to confounding factors. But if you use rubrics for grading, you can identify the portion of the rubric that measures achievement of the specific learning objectives that the innovation was designed to address, and tabulate data for the control and experimental groups with respect to these objectives.*
- **Student surveys.** *Questions on how students perceive the innovation can be presented through a short stand-alone survey or integrated into routine course and teacher evaluations.*

Student survey results, even if favorable, may not be particularly compelling in isolation. Results may show that the experimental group performed better than the control group, but because of small sample size results are not statistically significant. But when combined and placed in the context of a sound pedagogical theory, these elements can produce a publishable work that has clear value to others.

Thus, when you plan to introduce a new “neat idea” into a course, it pays to identify a control group and develop an assessment plan at the same time. An assessment plan can often be formulated in a way that requires very little “extra” effort beyond what would have been done anyway while teaching the course. Your “neat idea” can thus be developed into a publishable paper with relatively little time investment beyond conducting and writing a literature review—and doing the review may well lead to further development and improvement of your idea.

An even easier approach, although not peer reviewed, is to publish your neat idea as a Teaching Tip. Although all items are present, they are severely truncated—one may skip the literature review (item #1).

This tip is partially based on a presentation at the 2015 Salt Lake City AIChE meeting. □

—KEVIN DAHM AND ANDREA J. VERNENGO, ROWAN UNIVERSITY

This one-page column presents practical teaching, advising, and diversity tips in sufficient detail that others can adopt the tip. Focus on the teaching method, not content. The column should be maximum 500 words, but subtract 50 words for each figure or table. Submit as a Word file to Phil Wankat <wankat@ecn.purdue.edu>.