VCU VIRGINIA COMMONWEALTH UNIVERSITY
Graduate School | Preparing Future Faculty Program

FUTURE FACULTY FOCUS

Virginia Commonwealth University Graduate School Spring 2016

Grad 604 New PFF Course

The Preparing Future Faculty Program has added a new course to the curriculum. Students can now take Grad 604 Teaching, Learning , Technology and the Future of Higher Education offered for the first time Spring 2016. Grad 604 is a two credit course that replaces Grad 605 which is not currently being offered.

Description of Course

This course is designed to provide students with an introduction to contemporary technologies and the implications for instructional practices that can serve as both a foundation and a process for continued growth and development in understanding teaching and learning. Throughout the course students will explore and critically examine how the World Wide Web and emerging digital technologies are changing the landscape of learning in higher education. Class sessions will consider key instructional contexts / issues and explore the ways in which digital technology might enhance learning. Specific attention will be given to the ways in which students explore, select, use and assess the use of technology in teaching.

Additional questions about the course should be directed to Dr. Enoch Hale, the course instructor. You can also email the PFF staff at pffprogram@vcu..

Grad 602 is also offered this Spring and is taught by Dr. Sharon Zumbrunn

"Come and explore how this course can help prepare you to be on the cutting edge of teaching and learning technologies and help craft your professional portfolio as you enter the job market."

- Enoch Hale Ph.D., Grad 604 Instructor

In This Issue

Carl Wieman

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Carl Wieman a professor of physics and of the Graduate School of Education at Stanford University. He is the founder of the Carl Wieman Science Education Initiative (CWSEI) at the University of British Columbia and the Science Education Initiative at the University of Colorado. He is a Nobel Laureate in Physics and served as the Associate Director for Science in the White House Office of Science and Technology Policy Cwieman@stanford.edu, 650 – 497-3491.

A Better Way to Evaluate Undergraduate Teaching

By Carl Wieman

A major problem in higher education is the lack of a good way to measure the quality of teaching. This lack makes it very difficult for faculty to objectively determine the quality of their teaching and systematically work to improve it. It also makes it difficult for them to document that quality, either within the institution or for external accreditors. Institutions are unable to incentivize improvement, track improvement, or demonstrate to external stakeholders or accreditation agencies the quality of teaching that they provide

Criteria for evaluation of teaching quality

We propose a simple and operational definition: the effectiveness with which the teacher is producing the desired student outcomes for the given student population. The biggest difficulty in evaluating the quality of teaching is that the attainment of these outcomes in an absolute sense is highly dependent on the backgrounds of the students and the specific outcomes as defined by the course and instructor. Thus, meaningful measures of teaching quality must separate out the impact of the teacher from the many other factors that affect attainment of educational outcomes.

If improvement in teaching is to happen, it must become a credible component in this incentive system, and to become a credible component it must meet certain criteria of quality-- criteria which the corresponding metrics of research quality already meet.

1. Validity. The most important criterion is that the measures of teaching quality must correlate with the achievement of the desired student outcomes which define quality.

2. Meaningful comparisons. The individual instructors needs to have a standard they can compare with to know how well they are doing, and what they might do to improve. They also need a way to compare their performance with the standards of their department and their institution. Department Chairs need to be able to compare the teaching of all the individuals in a department, and Deans and Provosts need to compare the performance of similar departments at the same or at different institutions.

3. Fairness. This requires that the method can be used across nearly all courses/instructors with nearly equal validity. This will be true only if the correlation between the measured values of “teaching quality” and the measures of student outcomes is greater than the correlation between measured values of “teaching quality” and other factors that are not under the instructor’s control. (e. g. class size, level, subject, institutional type)

4. Practicality. It must be possible to obtain the measures of quality for instructors on an annual basis without requiring substantial investments

5. Improvement. The measure needs provide clear guidance to an instructor as to how well they are doing and how they can improve.

Faculty almost universally express great cynicism about student evaluations, the predominant way that undergraduate teaching is currently evaluated, and correspondingly, about the institutional commitment to teaching quality when student evaluations are the dominant measure of quality.

The Teaching Practices Inventory

Here we offer a different method for evaluating teaching that does meet the above criteria, at least for the STEM disciplines. It would likely also work for the social sciences with some modest changes, and an analogous instrument could be developed for the humanities. The design principle used to create this method was to first develop an instrument that could characterize as completely as possible all the teaching practices in use in nearly all STEM courses, while requiring little time and involving little subjective judgment in collecting the necessary information. Knowing the full range of teaching practices used in any given course, it is then possible to determine the extent of use of practices that research has shown produce

consistent improvements in student outcomes when compared to possible alternatives. *The quantitative measure of extent of use of practices that correlate with improved student outcomes is our measure of teaching quality*.

It may seem surprising to evaluate the quality of teaching by looking only at the practices used by an instructor. However measuring practices as a proxy for a difficult-to-measure ultimate outcome is quite common when there are substantial correlations between the two. The example most relevant to this discussion is the routine measurement of a science faculty member's research contributions for annual review. In the natural sciences this is typically based primarily on the numbers of papers published in reputable journals and research grants that a faculty member has had in the past 1-3 years, data that can be quickly and easily collected. This system works quite well, because, while having a relatively large number of grants and publications does not guarantee substantial research contributions, they tend to be well correlated. Correspondingly, a faculty member in the sciences who does not get research money and does not publish papers is very unlikely to be making significant research contributions. Using effective, research-based teaching practices as a proxy for the desired student outcomes is based on much the same concept.

This use of such a proxy is only meaningful because of all the research in the past few decades establishing strong correlations between the type of STEM teaching practices used and both the amount of student learning achieved and course completion rates. These correlations have been shown to hold across a large range of different instructors and institutions. Those practices that are linked to improved learning in STEM are also consistent with empirically-grounded theoretical principles for the acquisition of complex expertise. This explains the consistency of the results across disciplines, topics, and level of students, and provides confidence that those practices will be similarly effective in situations for which there is not yet research.

The teaching practices inventory (TPI) characterizes all elements of how a course taught. The current version of the inventory was developed over a six year period, during which it underwent numerous reviews by faculty and experts in undergraduate STEM education, and several rounds of real-world testing. This is discussed in detail in Wieman and Gilbert (2014). We have now used the final version of the inventory to collect data on the teaching of more than 200 course offerings at UBC, from across the disciplines of biology, computer science, earth sciences, mathematics, physics, and statistics. It has also recently been used on a limited basis by several other institutions. Most instructors complete the inventory in less than ten minutes.

Continued from page 3. **Table 1. Teaching practices inventory categories**

I. **Course information provided**

Information about the course, such as list of topics and organization of the course, and learning goals/objectives.

II. **Supporting materials provided**

Materials provided that support learning of the course material, such as notes, video, and targeted references or readings.

III. **In-class features and activities**

What is done in the classroom, including the range of different types of activities that the instructor might do or have the students do.

IV. **Assignments**

Nature and frequency of the homework assignments in the course.

V. **Feedback and testing**

Testing and grading in the course, and the feedback to students and feedback from students to instructor.

VI. **Other**

Assorted items covering diagnostics, assessment, new methods, and student choice and reflection.

VII. **Training and guidance of teaching assistants**

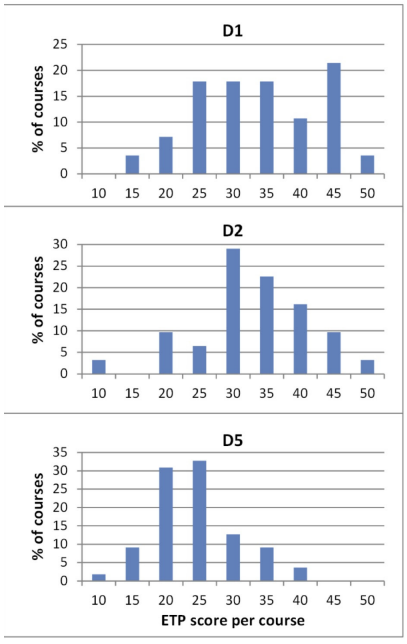
What selection criteria and training are used for course teaching assistants, and how their efforts are coordinated with other aspects of the course.

VIII. **Collaboration or sharing in teaching**

Collaboration with other faculty, use of relevant education research literature, and use of educational materials from other sources.

Scoring rubric

The inventory responses provide a detailed picture of how a particular offering of a course is taught, and, when data are aggregated, how a department teaches. We have created a rubric that converts the raw inventory data for a course into an "extent of use of research-based teaching practices (ETP) score" for each of the eight TPI categories, and for the course as a whole. This is a measure of the extent of use of practices that research has shown are most educationally effective. ETP points are given for each practice for which there is research showing that the practice improves learning. The distribution of points is shown on the inventory in Wieman and Gilbert (2014) along with references to the research that is the basis of scoring. Figure 1 illustrates



The ability of the TPI to readily identify the extent to which effective teaching practices are used by the different faculty within a department, and the differences between departments. It is somewhat startling to see the actual range of use of effective teaching practices within a typical department--factors of 4 to 5. High scoring courses incorporate many different mutually beneficial practices across all categories that support and encourage student learning, while low scoring courses have very few.

Benefits of Using the TPI

Use of the TPI for evaluating teaching has benefits for instructors, institutions, and students. Faculty can now readily see how they can improve their teaching. Simply by looking at the TPI and its scoring rubric, faculty can see the range of teaching practices that are in relatively common use and what the research indicates as to what practices will have an impact on student learning. Comparing their own TPI results with others shows them their respective strengths and weaknesses. The TPI provides them with a way to objectively document the quality and improvement in their teaching, and can free them from the capricious, frustrating, and sometimes quite mean-spirited, tyranny of student evaluations.

Departments could use TPI data to benchmark the quality of their teaching, and identify targets of improvement and the results of improvement efforts. An example of this use is shown in Figure 2, for a department that worked on improving its teaching between 2007 and 2012. It takes little time to obtain data that can be used for institutional or accreditation reviews. Institutions could use TPI results in the same way to track their

ALUMNI SPOTLIGHT

Landon Holbrook

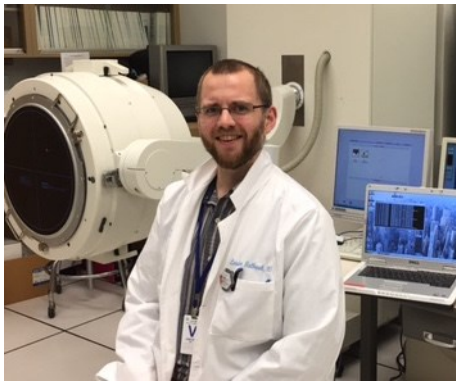
Landon Holbrook is currently a post-doctoral research associate at the University of North Carolina at Chapel Hill. He received his PhD. from VCU School of Engineering. He studies the impact of cystic fibrosis and chronic bronchitis on lung function

What does the PFF Program mean to you?

The PFF program means equipping graduate students with theories of teaching, learning about academic administration and providing the framework for developing the skills of teaching.

How did your experience in the PFF program enhance you understanding of what it means to be faculty and impact your plans for a career in academia.?

The PFF programs helped me to understand that I will need to be motivated to determine my direction (career and research) and protect the large amount of time that is required for grant writing and publishing. I know that I will only be satisfied doing research in academia if I care about research because at many engineering schools the research is most important.



How did experiences with the PFF program and receipt of the PFF program certificate of achievement give you an "edge" in your career?

The PFF experience was beneficial in applying for my first job at UNC, understanding what was appropriate to ask in the interview, and I imagine will continue to be helpful in future teaching positions.

Tell us a little bit about your internship experience and share with us the impact the project and mentoring relationship had on you?

The project and mentoring relationship both consisted of scholarship and instruction in fluid mechanics. My mentor provided excellent guidance and practical criticism after watching my teaching that improved my teaching and my affinity for teaching.

What is the most crucial piece of advice that you would give to students currently enrolled in the PFF Program coursework?

The coursework is most useful when you have teaching experience to draw from. You need to learn from your mistakes to understand what it means to be a good teacher. Don't just talk, TEACH.

Continued from page 4. overall improvement and to compare the quality of their teaching with their counterparts in peer institutions, in much the same way as they currently routinely compare research productivity and salaries across institutions.

Limitations of the TPI and scoring rubric for evaluating teaching

We were not successful in creating an inventory that was appropriate for use in all undergraduate STEM courses, in that it does not work for instructional labs, project-based courses, or seminar (largely student driven) courses, because such courses tend to be quite idiosyncratic.

The obvious concern with the TPI data and scoring rubric as a measure of teaching quality is that this is measuring the use of particular practices, not how well those practices are being used. It is important to remember that the important comparison here is not with perfection, but rather with alternative methods of evaluation. There are numerous research studies showing strong correlation between undergraduate STEM learning and the teaching methods used, independent of other characteristics of the teaching. For example, many studies have compared the same instructor using different methods (research-based active learning vs. traditional lecture). We have done experiments at the CWSEI showing it is extremely difficult to rigorously measure quality, likely impossible to do on a routine basis in undergraduate courses.

Conclusion

Current methods of evaluating teaching at colleges and universities fail to encourage, guide, or document teaching that leads to improved student learning outcomes. Here we present an alternative that provides a measure of teaching quality that is correlated with desired student outcomes, free from large confounding variables, and can be used to make meaningful comparisons of the quality of teaching between faculty members, departments, and institutions. In contrast with current methods for evaluating undergraduate teaching, it is appropriate to incorporate the teaching practices inventory into the institutional incentive system. It also provides a way for faculty members, departments, and institutions to support claims of teaching commitment, improvement, and quality . **Resources :**Berk R (2005). “Survey of 12 strategies to measure teaching effectiveness.” *International Journal of Teaching and Learning in Higher Education* 17, 48–62. Clayson, D. (2009)"Student evaluations of teaching: are they related to what students learn?: A meta-analysis and review of the literature." *Journal of Marketing Education* 31, no. 1: 16-29. Freeman S, Eddy SL, McDonough M, Smith MK, Wenderoth MP, Okoroafor N, Jordt H (2014). “Active learning increases student performance in science, engineering, and mathematics.” *Proc Natl Acad Sci*, 10.1073/pnas.1319030111. Singer S, Nielsen N, Schweingruber H (2012). *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*, Washington, DC: National Academies Press. Wieman and Gilbert (2014), “The teaching practices inventory; a new tool for characterizing college and university teaching in mathematics and science,” CBE - *Life Sci-*

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