

January 2017

Peer-Reviewed Exploration in Teaching: A Program for Stimulating and Recognizing Innovations in Teaching

Rahul Simha

George Washington University, simha@gwu.edu

Raluca Teodorescu

George Washington University, rteodore@gwu.edu

Recommended Citation

Simha, Rahul and Teodorescu, Raluca (2017) "Peer-Reviewed Exploration in Teaching: A Program for Stimulating and Recognizing Innovations in Teaching," *International Journal for the Scholarship of Teaching and Learning*: Vol. 11: No. 1, Article 3.

Available at: <https://doi.org/10.20429/ijstl.2017.110103>

Peer-Reviewed Exploration in Teaching: A Program for Stimulating and Recognizing Innovations in Teaching

Abstract

In an academic world driven by student ratings and publication counts, faculty members are discouraged from exploring new pedagogical ideas because exploration takes time and often goes unrecognized. The contrast with research is striking: everyone is expected to explore and innovate in research, whereas very few make exploration in teaching their norm. This paper presents a case study illustrating a program, the *Peer-Reviewed Exploration in Teaching* (PRET) program, designed to encourage and recognize faculty when they implement teaching innovations. The program provides feedback during all stages of a teaching innovation, including outside-classroom activities, and incorporates a rigorous peer review process so that successive such PRETs can accumulate into a record for tenure and promotion. The paper describes the program's rationale, initial implementation, and lessons learned. Perhaps one of the most interesting lessons is that faculty explorations often go beyond a standard inventory of active learning techniques when they are encouraged and supported to explore.

Keywords

Teaching innovations, recognizing teaching excellence

Creative Commons License

Creative

Commons

This work is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)

Attribution-

Noncommercial-

No

Derivative

Works

4.0

License

Peer-Reviewed Exploration in Teaching: A Program for Stimulating and Recognizing Innovations in Teaching

Rahul Simha¹ and Raluca Teodorescu²

¹Department of Computer Science, George Washington University, Washington, DC 20052, USA

²Science, Engineering, and Technology Unit, Montgomery College, Tahoma Park, MD 20912, USA

(Received 8 July 2015; Accepted 11 November 2016)

In an academic world driven by student ratings and publication counts, faculty members are discouraged from exploring new pedagogical ideas because exploration takes time and often goes unrecognized. The contrast with research is striking: everyone is expected to explore and innovate in research, whereas very few make exploration in teaching their norm. This paper presents a case study illustrating a program, the Peer-Reviewed Exploration in Teaching (PRET) program, designed to encourage and recognize faculty when they implement teaching innovations. The program provides feedback during all stages of a teaching innovation, including outside-classroom activities, and incorporates a rigorous peer review process so that successive such PRETs can accumulate into a record for tenure and promotion. The paper describes the program's rationale, initial implementation, and lessons learned. Perhaps one of the most interesting lessons is that faculty explorations often go beyond a standard inventory of active learning techniques when they are encouraged and supported to explore.

INTRODUCTION

This paper presents the Peer-Reviewed Exploration in Teaching (PRET) Program, a model for a university-wide program appropriate for all disciplines that is designed to: 1) stimulate teaching innovations, 2) support faculty during the innovation process, 3) recognize faculty efforts, and 4) create an environment for teaching explorations that last beyond the program completion.

Why Innovate?

Let us first address a more basic question: why bother to innovate in teaching? Isn't it be enough to let a few innovate, prove that their techniques work, and offer teaching workshops to the rest of us? We argue that there are at least a few reasons why innovation, or at least curiosity-driven exploration, should be more common. The first relates to the complexity of learning and fostering a collective effort in academia that is equal to the task: if more faculty are engaged in systematically exploring what works and what doesn't, we are likely to improve student learning outcomes. Consider, for example, that there are 9,400 physics faculty (White, Ivie, Ephraim, 2012) in the nation, most of whom are engaged in some scholarly activity in physics to understand the complexities of the physical world. Why aren't as many faculty focused on addressing the complexities of learning? If student learning is as complex as is commonly believed, it invites the participation of more faculty in exploring and understanding how to make it work well. A second reason arises from the need to *adapt* techniques locally: each one of us has students from different backgrounds, who are in turn taking local flavors of courses. Thus, for example, one does not effectively use clickers in exactly the same way for a mid-morning class of residential undergraduates in chemistry, as for an evening class on health policy for working professionals. Such local adaptation takes time to refine, and constitutes a protracted exploration over several course offerings that needs nurturing and administrative support. Others have written about this need as well. For instance, Wood (2009) explains (using biology as an example) why innovation in biology teaching is needed: 1) for the U.S. to remain competitive in the global economy; 2) to exploit new discoveries in educational psychology, cognitive science, and

neurobiology that have the potential to improve student learning; 3) to build on and adapt research from Discipline-Based Education Research (DBER) groups; and 4) to produce better biology majors. Finally, a culture of constant experimentation strengthens our collective agility in academia to respond to a rapidly changing landscape in higher education.

Relationship to Tenure and Promotion

What is also clear, in addition to the need to stimulate pedagogical exploration, is that standard approaches to *evaluating* teaching for tenure and promotion are limited in what they evaluate, often relying just on student ratings or isolated classroom visits. Student evaluations of teaching can provide valuable feedback about the instructor's teaching effectiveness (Svinicki & McKeachie, 2010), but researchers have mixed findings about them (Boring, Ottoboni, Stark 2016; MacNell, Driscoll, Hunt, 2015). This problem has been recently recognized as challenging (Stark & Freishtat, 2014) despite the increasing emphasis on helping faculty develop instructional competence since the 1980s (Eble & McKeachie 1985; Seldin, 1990). Elton (1998) aimed to define the concept of "teaching excellence" and discovered that it is a complex concept and requires defining excellence at individual, departmental, and institutional levels. At the same time, a full-fledged statistically rigorous learning outcome study may not be practical for everyone, since not everyone has multiple sections for a careful control-and-experiment procedure, nor are there statistically reliable tests of learning in every subtopic of every field. Furthermore, some types of pedagogical experimentation will involve only a part of course, or another goal such as student engagement. Also, it is important to encourage adaptation of technique rather than have the pressure to solely create something new out of whole cloth; for example, a biology professor in our program experimented with case studies in her introductory biology class, a relatively new idea in biology but quite well-established in business schools.

A comparison between teaching and research raises yet another issue. In research, faculty members are accustomed to publishing incremental work that accumulates over time into a strong record of scholarly work. In alignment with this tradition, the

research realm offers a range of publication outlets from posters at a conference to a top archival journal. All of these are well-understood and confer some degree of respectability to the list of individually modest contributions that comprise most research CVs. Furthermore, faculty are “trained” in writing up research articles, and there exists a substantial infrastructure (conferences, journals) to process these articles. On the teaching side, aside from the SOTL that works for a few faculty, all we commonly have are student ratings and the occasional classroom visit. Boyer (1990) famously analyzed “what it means to be a scholar” and concluded that authentic scholarship involves discovery, integration, application, and teaching. He explains that “teaching, at its best, shapes both research and practice” and it means “not only transmitting knowledge but transforming and extending it as well”. Inherent conflicts in the messages that come down to faculty are well known, whether it is between research and teaching, or arises from extramural agency (see the writings of Giroux (2015, 2006), for example).

What is missing is a *structured process* for faculty to explore pedagogical ideas in their classroom, receive rigorous peer feedback within their institution, and be able to record the results so that successive such explorations can *accumulate into a record for tenure and promotion*. This will both help faculty document their efforts and set the stage for administrators to clearly acknowledge faculty teaching efforts in the same way, and with the same respectability in which the research publications acknowledge their research efforts.

Faculty Development and Institutional Transformation

A fundamental change in the way faculty, departments and institutions approach, practice, and evaluate teaching takes time and triggers additional hard questions such as: Are faculty ready to meet students where they are? And, are faculty willing to recognize shortcomings in their teaching? These and other issues and questions have been highlighted by Caster & Hautala (2008) who describe in detail the challenges they faced when deciding to embark in a department-level teaching reform.

Once innovations are created, implementation details become important both at smaller and larger scales. Fixen and colleagues (Fixen, Naoom, Blase, Friedman, Wallace, 2005) performed a synthesis of the literature on implementations in the medical field and made the following recommendations for purveyors of well-defined practices and programs: 1) develop research collaborations, 2) create a community of practice, and 3) share the lessons learned with these communities. Gawande (2013) went further and discussed the conditions under which innovations spread fast. According to him, despite the evolution of technology, “people talking to people is still the way that norms and standards change.”

As interest in faculty development grows, there is an increasing need for programs that go beyond the usual teaching workshops. This is because: 1) the divergent expectations between educational researchers and faculty constitute real barriers for innovations that need to be overcome (Henderson & Dancy, 2008); 2) after embracing changes in teaching, a significant number of faculty leave the innovation process (Henderson, Dancy, Niewiadomska-Bugaj, 2012); 3) after carrying on an innovation to the end, a significant number of instructors do not realize that their implementation has not worked out for students (Ebert-May, Derting, Hodder, Momsen,

Long, Jardeleza, 2011); and 4) the way innovations are disseminated is rapidly changing (Rogers, 2003).

Conception and colleagues (Conception, Holtzman, Ranieri, 2009) described a successful seven-year long university-wide initiative in which faculty have changed fundamentally their way of teaching and assessing teaching. The authors identified three essential elements that ensured the success of the initiative: 1) faculty started with well-defined learning questions, used disciplinary expertise and based their interventions on learning theories; 2) faculty collaborated during the development and implementations and evaluated their initiatives often; 3) faculty received public support and professional acknowledgement.

Finally, in recent years, several professional accrediting associations included in their accreditation criteria some guidelines related to the professional development of faculty. For example, the Southern Association of Colleges and Schools (2011) lists the criterion “The institution provides ongoing professional development of faculty as teachers, scholars, and practitioners.” North Central Association of Colleges and Schools (2011) approved the criterion “The organization values and supports effective teaching. Possible evidence: a) The organization provides service to support improved pedagogies, etc.” Western Association of Schools and Colleges (2008) requires that “The institution maintains appropriate and sufficiently supported faculty and staff development activities designed to improve teaching and learning, consistent with its institutional objectives.” This problem is particularly difficult at research universities where it is hard to establish a balance between teaching and research excellence (Dee Fink, 2013).

Relationship with SoTL

While efforts to define SoTL more clearly are made constantly, critics argue that the terms are not clear (Pan, 2009) and even the association of terms *scholarship* and *teaching* is semantically problematic. New models that emerge call for scholarships that accept the learning-centered teaching as a starting point and advocate for recognizing DBER as a field of study (Woodhouse, 2010), while others caution the community of scholars about possible pitfalls that could occur if the different DBERs function in isolation (Weimer, 2008).

The development of a new scholarship of teaching is a profound and lengthy process that could lead to deep transformation. No wonder that Weimer (2013) in the preface of her second edition of *Learner-Centered Teaching: Five Key Changes to Practice* states: “I believe that this edition is stronger because it tackles with more vigor what hasn’t changed since the 2002 edition, and regrettably, that includes almost everything targeted for change in the first edition”. While reflecting on her own transformation, Sturges (2013) explained that difficulties arise because faculty often do not have formal training in pedagogy. She identified at least six steps of faculty inner transformation, each triggered by basic questions. In the author’s words, they are: “Do I know What SoTL is? Is SoTL for me? What am I trying to improve? Should I go for it? Should I share my findings? I published, now what?” Taking this further, other researcher (Svinicki, 2012), also reflecting on her transformation, suggests that SoTL should be done by research teams and programs should develop from iterations that could lead to failures and should involve longitudinal studies, while Zakrajsek

(2013) explains that a primary condition for success is that faculty get into the habit of consulting the existing literature every time they contemplate teaching innovations. Given the complexity of the process, faculty development becomes important.

Yet, some examples show that the institutionalization of successful SoTL is possible. Marketti and colleagues (Marketti, VanDerZanden, Leptien, 2015) interviewed 18 faculty from all ranks whom she called SoTL champions. The interviews revealed that, even though initially many of the faculty became interested in SoTL because they were looking for ideas to improve student learning, over time they found additional personal and professional benefits beyond the ones related to promotion and tenure. The PRET program tries to strike a middle ground by making exploration and peer-reviewed contributions more accessible to faculty.

THE PEER-REVIEWED EXPLORATION IN TEACHING (PRET) PROGRAM

Our Peer-Reviewed Exploration in Teaching (PRET) program is a mechanism that, roughly equivalent in effort to producing a research article, allows faculty to demonstrate a *peer-reviewed contribution to teaching with real impact in their classroom*. In designing the PRET program, we sought to respect several constraints. Ideally, we wanted a program that:

- lasts no longer than a semester but includes innovations that can be continued;
- encourages collaboration and works for a cohort of faculty from across the disciplines;
- encourages novel and out-of-the-box ideas and curiosity-driven exploration, while resulting in concrete assessable outcomes;
- has a direct impact on student learning in the participants’ own classroom;
- features multiple forms of rigorous intramural peer-review;
- is grounded in the literature on pedagogy, and the scholarship of teaching and learning;
- and, of course, stimulates exploration beyond the usual established techniques in active learning.

Our program was initiated in Spring 2012 and is informed by innovative trends in education (Beichner et al., 2007; DeHaan, 2005; Holdren & Lander, 2012) and encourages both curiosity-driven pedagogical experimentation, as well as the adoption of well-established pedagogical techniques that are new to the individual. Many of these elements are embedded in our program described below. During a PRET, a professor spends between 30-50 hours over a semester and goes through a number of steps:

1. writes and revises, based on anonymous peer-review, a proposal that describes specific learning-objectives and a substantial classroom intervention that is grounded in pedagogical literature and designed to meet those learning objectives;
2. invites peers to observe and review the intervention as implemented over several weeks;
3. allows peers to interview students (without the instructor present) to assess and report on impact on their learning;
4. reflects on a review report written by peers;
5. submits the original proposal, review report, and reflection

as the final package for additional blind peer review.

Typically, the visiting peers are from the cohort of faculty undertaking the program in a particular semester. The anonymous reviews in step 5 are from reviewers selected outside the cohort but who have either been past participants in the program or have distinguished themselves in teaching at the university. For example, 10 professors signed up for the Spring 2013 cohort; each person in the cohort was assigned a primary and secondary reviewer from among the others in the cohort. The last review (of the whole package), however, is typically done from outside the cohort.

The following are some examples of innovations implemented through this program:

- *Game design and writing in a freshman writing course*. A writing instructor asked students to collaboratively design a reality game for a given social problem, write about the design, write the instructions, and write about playing the game. The goal was to create an authentic writing experience and to engage the students at a high thinking level (creating, synthesizing).
- *Simulation in an introductory political science course*. Students in this course spent four weeks conducting simulations both online and in-class to delve deeper into the material underlying the learning objectives. In teams, students represented their countries, trading, addressing global warming, fighting terrorists, and even each other. Class time was dedicated to analysis of strategies, negotiations, and some hands-on simulation.
- *Case studies in an introductory biology course*. Students in this course, who normally expect a descriptive and memorization-intensive course, were in addition given case studies that asked them to apply principles to solve a biological problem with a realistic application. Students had to read further on their own, and articulate how they applied principles from the course towards addressing the questions in the case study.

To avoid merely gimmicky ideas, the PRET program requires applicants to follow a proposal template designed to force PRET participants to connect learning outcomes with their proposed exploration, and to ground this in the literature. The proposal structure asks faculty to explain their idea in detail, the motivation, related literature, why the idea is connected to the learning objectives, the thinking level of their objectives according to a taxonomy of educational objectives of their choice, and the specifics of the learning activities. Anonymous reviewers of the proposals often provide constructive feedback, resulting in much improved revised proposals. Similarly, the team that visits the class also runs a focus group with the students to understand how the exploration impacted them.

Having described the program, we now ask: does the PRET program address the constraints and goals set out earlier? We argue that the combination of the proposal, the reviewers’ report and the reflection roughly parallel a research article (an experiment, the outcomes, and conclusions). The peer-review is rigorous, partly anonymous (review of the proposal and the final package) and partly in person (the review team sent to the classroom). The program evaluates impact on students through a focus-group interview. Finally, because proposed ideas are shared widely within

a cohort, the program encourages a multi-disciplinary viewpoint. Participants have often remarked about how instructive it is to observe the PRET interventions in other disciplines.

The long-term goal of the PRET program is to provide teaching-focused faculty with a way to develop a strong portfolio of teaching contributions (PRETs) that, in a manner comparable with research contributions, have each been subjected to rigorous peer review and can be reported on CVs and annual reports. We will next describe the lessons learned from three years of offering the program at GWU, and will include suggestions for implementing the program at other universities.

Lessons from Study

Although our program has only recently been instituted, we have sought to explore its impact on faculty. Our case study is based on data from two cohorts with a total of N=14 faculty. PRET is offered every Spring semester and it is advertised through all the GW faculty listservs. The instructors who participated in the PRET program self-selected themselves and they ranged from beginners to experienced instructors. The majority of them were teaching-focused faculty. There were no changes in the PRET protocol from one cohort to the other. For the two cohorts we mentioned, we examined two types of data: (1) the products from the PRET program including proposals, comments on proposals, reviews from the peers that visited the classroom, reflections and final reviews and (2) an anonymous survey administered to participants after the completion of the program. The written materials, such as proposals and reviews, were examined by the two authors independently and initially coded according to Ambrugh's scale. Then, we reviewed the more complex interventions to analyze their Bloom level (Anderson et al., 2001). The raw survey data was similarly analyzed.

Given our relatively small sample size, we questioned if a survey was an appropriate tool for collecting feedback, but after analyzing alternative methods like focus groups with faculty or interviews, we decided that the anonymous survey would allow faculty to express their thoughts more freely. The survey was administered online and faculty were invited to participate. No rewards of any kind were offered to the participating faculty.

The lessons we learned can be broadly described through the following questions:

- *Does PRET work for all disciplines?* The faculty who undertook the program were spread across a variety of disciplines including: physics, biology, chemistry, nursing, writing, and political science and they all seemed comfortable innovating according to the PRET protocol. Additionally, we didn't encounter any situation in which a faculty member wanted to participate in PRET and found it inappropriate for his or her discipline. Thus, we have reasons to believe that PRET works for any discipline.
- *Is PRET suited to only some types of courses?* The courses included freshman courses (9 cases), courses required for the major (13 instances) as well as graduate courses (2 courses). Note that some courses count in several categories. All of these courses were in-classroom courses. Therefore, we think that PRET seems to be suitable for any type of in-class courses, while its suitability for online courses would have to be further explored.

- *Is PRET time consuming?* Faculty spend between 30-50 hours over a semester to go through all the PRET steps.
- *Does PRET indeed produce innovation?* To address this question, we examined the proposed interventions, classifying the learning activities using the active learning inventory described in (Van Ambrugh, Devlin, Kirwin, Qualters, 2007). This tool showed us at least two results: 1) instructors choose to implement innovations that are aligned to the student-centered learning techniques and 2) instructors go beyond existing popular innovations. We have been able to map all the learning activities implemented onto the items listed by Van Ambrugh's instrument except some found in 8 (out of N=14 courses) which were outside the list. This suggests that many faculty were indeed spurred into trying something altogether new. The interventions proposed by most faculty were complex (combinations of elements in Ambrugh's list, or combinations of entirely new activities), with multiple activities spread across various levels of thinking complexity. Figure 1 below illustrates the distribution, which shows that most activities were of medium complexity or higher.

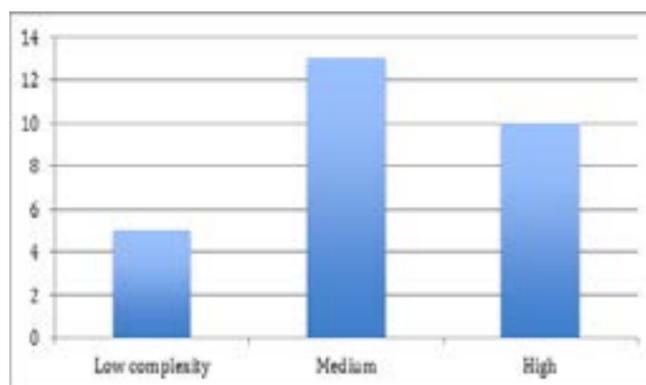


Fig. 1 Categorization of learning activities into low, medium and high complexity according to van Ambrugh's definitions.

- *What do participating faculty think about teaching innovation?* Faculty feel strongly that innovation is important (84%) and listed the following as the top three barriers to innovation: (1) Lack of administrative recognition (69%); (2) significant effort needed (62%); (3) lack of recognition from colleagues (54%).
- *Does faculty innovation have an impact that outlasts the program?* Among the faculty surveyed, 62% appear to continue to use their PRET ideas in their classes. The remaining ones realized through the PRET program that their innovation was either not appropriate for their classes, or too time consuming, or required further modifications that they are working on.
- *What is the impact of the program on faculty tenure and promotion?* The feedback that we received from the participants led to its recognition by the administration. PRET is now not only a part of the formal university annual report form, but also a part of the tenure and promotion portfolio.

- *Does the Administration recognize PRET?* Besides the reasons mentioned at the previous point, it is worth mentioning that the administration took an active role in advertising PRET-related events and in sponsoring PRET faculty to disseminate their PRET experiences at GW's Teaching Day, an annual event celebrating teaching. Additionally, PRET has its own website administered and supported by the administration.
- *Once the program is complete, does the sustained change in the classroom endure to justify the return on the resources invested in it?* The majority of faculty continue to use the PRET innovation in the classes after they complete the PRET, some of them even start to present their findings at national conferences, besides their presentation at the GW Teaching Day. These facts suggest that faculty tend to return to the resources invested in PRET.
- *How are faculty concerns about student evaluations addressed?* It is well-known that faculty perceive that classroom innovation can sometimes bring about weaker student ratings (Michael, 2007). This is one reason why the program explicitly eschews the standard end-of-semester ratings in favor of peer reviews and student focus groups run by faculty.

How could such a program be adopted at other universities? What is involved and what are the costs? We propose that the university's teaching center together with strong support from the administration launch a pilot cohort as we did. Intrepid, early-adopter faculty would need to be recruited for the first cohort, after which they would serve as evangelists. Clearly, strong support from the administration is necessary, both in messaging and the willingness to recognize those who complete the program. The only real cost is the time needed by the program's administrator, possibly a faculty member granted some release time.

CONCLUSION

In this paper, we made a case for spreading the wealth of innovation in teaching. Innovating and exploration is fun, stimulating and deeply satisfying, but is challenging to achieve in a teaching climate dominated by student ratings and weak recognition by colleagues and administrators. The PRET program was designed to offset these barriers to innovation by providing a structured process to encourage and support faculty in innovation, while providing rigorous peer review and administrative recognition. In addition, the program allows faculty to accumulate a number of these, each the rough analogue of a research article, into a record of sustained contributions to teaching. The program is ongoing at George Washington University, with the goal of recruiting more faculty, chairs and administrators in support.

ACKNOWLEDGEMENTS

Parts of this project were supported from NSF grant 1347516 (R. Simha, PI, GW Reform and Advancement of STEM Education Practices). The authors gratefully acknowledge the contributions made to the program by the first cohort of participants: Professors Michelle Allendorfer, Hartmut Doebel, Sandra Friedman, Bethany Cobb King, Carol Lang, Mark Mullen, and Steven Salchak.

REFERENCES

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A.,

Mayer, R. E., Pintrich, P. R., Raths, J. & Wittrock, M. C. (2001). *A taxonomy for learning, teaching and assessing. A revision of Bloom's taxonomy of educational objectives*. New York: Addison-Wesley Longman.

Beichner, R. J., Saul, J. M., Abbot, D. S., Morse, J. J., Deardorff, D. L., Allain, R. J., Bonham, S. W., Dancy, M. H. & Risley, J. S. (2007). The student centered activities for large-enrollment undergraduate programs (SCALE-UP) project, in E.F. Redish and P.J. Cooney (Eds.) *Research-Based Reform of Introductory Physics*.

Boring, A., Ottoboni, K., Stark, P. B. (2016). Student evaluations of teaching (mostly) do not measure teaching effectiveness, *Science Open Research – EDU*, doi: 10.14293/S2199-1006.1.SOR-EDU.AETBZC.v1

Boyer, E. (1990). *Scholarship reconsidered: priorities of the professoriate. The Carnegie Foundation for the Advancement of Teaching*, New York: John Wiley And Sons.

Caster, B. & Hautala, R. (2008). Changing our brains: transforming a traditional view of scholarship and teaching. *International Journal for the Scholarship of Teaching and Learning*, 2(2), Art. 18.

Conception, D., Holtzman, M. & Ranieri P. (2009). Sustaining student and faculty success: a model for student learning and faculty development. *International Journal for the Scholarship of Teaching and Learning*, 3(1), Art. 29.

Dee Fink, L. (2013). *Creating significant learning experiences: an Integrative approach to designing college courses*, Chapter 6: *Better Organizational Support for Faculty*, San Francisco: Jossey-Bass.

DeHaan, R. (2005). The impending revolution in undergraduate science education. *Journal of Science Education and Technology*, 14(2), 253-269.

Ebert-May, D., Derting, T. L., Hodder, J., Momsen, J. L., Long, T. M., & Jardeleza, S. E. (2011). What we say is not what we do: effective evaluation of faculty development programs. *BioScience*, 6(17), 550-558.

Eble, K. E. & McKeachie, W. J. (1985). *Improving undergraduate education through faculty development*. San Francisco: Jossey-Bass.

Elton, L. (1998). Dimensions of excellence in university teaching. *International Journal for Academic Development*, 3(1), 3-13.

Fixen, D. L., Naom, S. F., Blase, K. A., Friedman, R. B. & Wallace, F. (2005). *Implementation research: a synthesis of the literature*. National Implementation Research Network, Report of Louis De La Parte Florida Mental Health Institute, University of South Florida.

Gardinier, L. F. (1994). *Redesigning higher education - producing dramatic gains in student learning. ASHE-ERIC Higher Education Report 7*.

Gawande, A. (2013). Slow ideas: some innovations spread fast. How do we speed the ones that don't? *The New Yorker*, 89(22), 36-45.

Giroux, H. A. (2015) Democracy in Crisis, the Spectre of Authoritarianism, and the Future of Higher Education. *Journal of Critical Scholarship on Higher Education and Student Affairs*, 1(7).

Giroux, H. A. (2006) Higher Education Under Siege: Implications for Public Intellectuals. *Thought and Action*, 63.

Henderson, C. & Dancy, M. (2008). Physics faculty and educational researchers: divergent expectations as barriers to the diffusion of innovations. *American Journal of Physics (Physics Education Research Section)*, 76(1), 79-91.

Henderson, C., Dancy, M. & Niewiadomska-Bugaj, M. (2012). The use of research-based instructional strategies in introductory physics: where do faculty leave the innovation-decision process? *Physical*

- Review Special Topics - *Physics Education Research*, 8(2), 020104-1.
- Holdren, J. P. & Lander, E. (2012). *Engage to excel: producing one million additional college graduates with degrees in STEM*. Report of the President's Council of Advisors on Science and Technology (PCAST).
- MacNeil, L., Driscoll, A., Hunt, A. N. (2015). What's in a name: Exposing gender bias in student ratings of teaching. *Innovations in Higher Education*, 40, 291-303.
- Marketti, S., VanDerZanden, A.M., & Leptien, J.R. (2015). SoTL champions: leveraging their lessons learned. *International Journal for the Scholarship of Teaching and Learning*, 9(1), Art. 4.
- Michael, J. (2007). Faculty Perceptions about Barriers to Active Learning. *Journal of College Teaching*, 55(2), 42-47.
- Pan, D. (2009). What scholarship of teaching? Why bother? *International Journal for the Scholarship of Teaching and Learning*, 3(1), Art. 2.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.) New York: Free Press.
- Seldin, P. & Associates (1990). *How administrators can improve teaching – moving from talk to action in higher education*. San Francisco: Jossey-Bass.
- Stark, P. B. & Freishtat, R. (2014). An evaluation of course evaluations. *Science Open Research* doi: 10.14293/S2199-1006.SOR-EDU.AOFRQA.v1
- Sturges, D. (2013). To SoTL or not to SoTL? *International Journal for the Scholarship of Teaching and Learning*, 6(2), Art. 2.
- Svinicki, M. (2012). Who is entitled to do SoTL? *International Journal for the Scholarship of Teaching and Learning*, 7(2), Art. 2.
- Svinicki, M., & McKeachie, W. J. (2010). *McKeachie's teaching tips: Strategies, research, and theory for college and university teachers*, 13th Ed. Belmont, CA: Wadsworth.
- Van Ambrugh, J. A., Devlin, J. W., Kirwin, J. L. & Qualters, D. L. (2007). A tool for measuring active learning in the classroom. *The American Journal of Pharmaceutical Education*, 71(5), 85.
- Weimer, M. (2008). Positioning scholarly work on teaching and learning. *International Journal for the Scholarship of Teaching and Learning*, 2(1), Art. 4.
- White, S., Ivie, R. & Ephraim, A. (2012). Results from the 2010 survey of physics degree-granting departments. *American Institute of Physics*, April 2012.
- Weimer, M. E. (2013). *Learner-centered teaching: five key changes to practice* (2nd Ed.), San Francisco: Jossey-Bass. From M. D. Cox, *Is Active Learning Not Working? Answers and Solutions From Implementation Science*, Presentation at 2015 Lily Conference, Bethesda Maryland, May 2015.
- Wood, W.B. (2009). Innovations in teaching undergraduate biology and why we need them, *Annual Review of Cell and Developmental Biology*, 25, 93–112
- Woodhouse, R. (2010). Hype or hope: can the scholarship of teaching and learning fulfill its promise? *International Journal for the Scholarship of Teaching and Learning*, 4(1), Art. 13.
- Zakrajsek, T.D. (2013). Scholarly teaching: suggestions for a road more traveled. *International Journal for the Scholarship of Teaching and Learning*, 7(1), Art. 2.