An Institution-wide Approach to Pedagogical Change

Mathew L. OUELLETT

───＜Abstract＞──────────────────────

　　Research demonstrates an ongoing gap between what pedagogical and educational researchers in the United States show are the most effective methods for teaching and learning in higher education and the implementation of such best practices in our university class-rooms. This article explores how a significant change in the teaching and learning culture of a university requires a systemic approach incorporating strategies and action for change at course, department and college levels. Additionally, it explores how educational develop-ment units contribute to addressing this disparity to promote the dissemination and implementation of evidence-based teaching methods in higher education.

1. Introduction

　This paper advances an argument for an institutional change approach to the implementation of student-centered active learning pedagogies. While this is not a new call to act (Boyer 1998), there remains a need to identify evidence-based strategies for disseminating and institutionalizing more effective teaching and learning practices (Henderson, Beach, and Finkelstein 2012).

　Changes in economic and social demands and the importance of a college educated and science literate workforce have sparked an

Associate Provost and Director, Office for Teaching and Learning
Purdy/Kresge Library, Teaching Commons, Wayne State University
(Visiting Associate Professor, Center for the Studies of Higher Education, Nagoya University)

industry-led demand for more graduates in science, technology, engineering, and mathematics (STEM) fields (PCAST 2012, Strohl 2010). Additionally, changing demographics demand that such graduates include more women and underrepresented minorities (PCAST 2012). Furthermore, complex global and national social issues such as environmental justice, climate change, agribusiness and genetically modified food streams require a significant commitment to increased scientific literacy across United States citizenry if we are to confront and contribute to the amelioration of such issues in a meaningful and democratic fashion. Such demands are reflected in the strategic priorities of national policies and funding agencies (National Science Foundation 2011).

Adoption of more complex accountability measures in university accreditation procedures also pushes for greater transparency and articulation of institutional goals and structures regarding student success (i.e., retention and graduation) and assessment of progress in traditional, hybrid, and online instruction (Eaton 2013, Jackson, Davis and Jackson 2010). Additionally, there is an expanded commitment to teaching and undergraduate learning in STEM disciplines as evidenced by the emergence of discipline based educational research (National Research Council 2012), national summits on teaching and learning (AAAS 2010, Brewer and Smith 2011), columns on educational research and pedagogy in top tier journals such as Science, and discipline-based association sponsored special interest and standing committees on teaching such as the American Chemistry Society and the American Association of Chemistry Teachers.

Faculty and educational development units have proven important to the implementation and diffusion of faculty innovation in teaching and learning. As campus wide resources, centers for teaching and faculty development approach institutional change initiatives with the balance of organizational and individual development foci required to facilitate such campus wide initiatives (Diamond 2005, Schroeder 2011).

2. Building an Institutional Climate to Support Innovation

Institutions of higher education can be notoriously difficult and slow organizations to change. For any such efforts to succeed, a combination of interventions are required, most especially the ongoing support and effort of chief academic administrators and faculty opinion leaders (Henderson, Dancy and Niewiadomska-Bugaj 2012, Mervis 2013). Collaboration between instructors and administrators is essential to development and implementation of institutional changes, to remove the risk of charges of top-down administrative demands (Henderson and Dancy 2007).

Often, senior faculty members cite a lack of time and the research-focused university reward structure as reasons for continuing to use passive lecture formats (Henderson, Beach and Finkelstein 2011). They also appear to demonstrate less persistence with teaching changes than younger faculty (Ebert-May et al. 2011); thus, there have been several national initiatives over the past several decades designed to influence the behaviors and priorities of less intractable new faculty.

For example, the Preparing Future Faculty (PFF) program, initiated in 1993 by the Council of Graduate Schools, uses a cohort model and mentors to work directly with senior doctoral students before they enter the academy as junior faculty members (Wurgler et al. 2013). Another example was the Carnegie Scholars Program. Begun in 1998 and continuing until 2005, this program worked with five interdisciplinary cohorts of faculty from across a range of higher education institutions. The participants worked individually and in peer groups on scholarship of teaching and learning projects (Hutchings, Huber and Ciccone, 2011). Discipline-specific initiatives include the Association of American Universities Undergraduate STEM Education Initiative (AAU 2011). However, the deep-seated changes in teaching and learning practices failed to catch fire.

More recently, discipline-based new faculty workshops have been aimed at influencing early career tenure-track faculty members by bringing them together as cohorts (Henderson 2008). For example, the American Chemistry Society (ACS) targets changes in teaching and learning with new chemistry faculty (Hilborn 2012), along with similar efforts in physics and

biology (Hake 1998, Henderson 2008, Ebert-May et al. 2011).

Faculty members' beliefs about teaching and learning and perceptions of what is most important for career success are deeply socialized. Quite rightly, some faculty will advance the argument that research publications and external funding contain far more merit than a focus on learning and teaching. Therefore, it bears consideration how, when, and with whom to introduce new initiatives. Finally, faculty culture, socialization, and self-perceptions are important considerations when considering changing existing practices.

We can look to other systemic change initiatives such as multicultural organization development and the first year student experience as models for approaches to institutional change in higher education (Marchesani and Jackson 2005, Schwartz and Swing 2005). Administrators and faculty will both benefit from education on how local efforts link to complex social and economic issues at the regional, national, and international levels (PCAST 2012). Watts (2002) posits that the adoption of an innovation (e.g., technologies) is determined by two critical factors: the perceived usefulness (e.g., increased productivity) of the innovation as weighed against barriers to adoption (e.g., cost). Given this well documented complexity of shepherding change initiatives in higher education (Benvenuto 2002), there are two frameworks that may be particularly useful: Roger's Model of Diffusion of Innovation and the work of Henderson, et al on institutional change and STEM education.

Rogers (2003) offers one of the most widely referenced models on diffusion of innovation in higher education. This model has been used to study a range of other types of change initiatives such as instructional technologies (Sahin 2006). Rogers (2003) defines an innovation as, "… an idea, practice, or project that is perceived as new by an individual or other unit of adoption" (Rogers 2003: 12). Regardless of how long the idea may have been around or how widely implemented elsewhere, if members of the organization perceive it of as "new", then it counts as innovation. Roger's model of innovation diffusion and adoption assumes that organization members will demonstrate a range of readiness for and willingness to persist with change efforts by dividing into two groups:

early adopters and late adopters (Rogers 2003: 22). Early adopters will distribute along a continuum of three locations: innovators (innovation "champions" and willing experimenters), early adopters (opinion leaders who help set the attitude towards the innovation), and early majority adopters (not the first or the last to adopt innovations). Late adopters are broken into two groups: late majority (those who wait until most of their peers adopt the innovation) and laggards (members who continue to be skeptical of the innovations and change agents alike) (Rogers 2003: 284).

To be successful, a change effort requires champions *and* critical mass, therefore a number of critical factors must work together to motivate members to persist and adopt new behaviors. Henderson, Beach, and Finkelstein (2011) suggest a four quadrant model with each an essential and equally important location for change efforts: faculty (developing reflective teachers); local leadership (e.g., the faculty governance body, provost, deans, chairs); creators of a campus wide culture of shared responsibility for student learning (shared vision, linking efforts across disciplines, rewarding excellence in teaching as well as research); and, links to national and disciplinary initiatives. The first two (curriculum and pedagogy and developing policy) are presented as top down while the development of reflective teachers and a shared vision as bottom up and innovation as necessarily including both individual and structural changes (Henderson, Beach, and Finkelstein 2011).

Borrego and Henderson (2014) suggest that change agents tasked with institutional level innovation are often guided, implicitly, by a single change strategy. They suggest change agents would increase success and design more robust change efforts by first making transparent their underlying assumptions about change, and expanding their application of a broader range of perspectives and strategies (Borrengo and Henderson, 2014).

Creating a climate of institutional change requires complex strategies that provide multiple points of entry for administrators, faculty, staff and students; include the voices of the widest possible range of constituents and opportunities for education, persuasion, and experimentation as a means of addressing the range of readiness for change across the faculty, and suitable reward structures (Borrego and Henderson 2014, Rogers 2003).

Additionally, such efforts require conscious leadership development, public endorsement, and consistent participation of chief academic officers such as provosts, deans and department chairs (Henderson, Beach, and Finkelstein 2012).

3. Building a Departmental Climate to Support Innovation

Departments are arguably the cornerstones of any change effort in higher education. It is imperative that departments and individual faculty members are supported to reflect on and discuss excellence in teaching as well as research, a regular and public part of department life. Moreover, it is not unusual for champions of innovation to find greater support outside of their home department (Borrego and Henderson 2014).

Often, there is a dearth of clear and consistent messages from senior academic administrators (chairs, deans, and provosts) that innovative teaching is valued and rewarded by the department and institution. Department chairs and faculty colleagues that drive reward structures (e.g., personnel committees, etc.) often lack appropriate knowledge on how to evaluate the contributions and challenges confronting innovative teachers. For example, the work involved in identifying new strategies that are course appropriate, time required for course redesign, process of adopting and implementing new pedagogical strategies, and the risk of a temporary dip in student evaluations when innovations are first implemented are all elements to be considered.

Diminishing fiscal resources present another obstacle to the diffusion of innovation. Departments often transfer responsibility for large entry- level courses to part-time personnel with lower salaries, modest benefits if any at all, to lower costs to institutions: this presents the real risk of a two-tiered department with tenured faculty dedicated to research-intensive endeavors and part-timers to teaching-intensive tracks.

A cohort of professors associated with the Howard Hughes Medical Institute proposes seven initiatives to rebalance the recognition, reward, and support offered researchers who are also excellent teachers (Anderson et al. 2011). The initiatives they advocate include: educate faculty about

research on teaching; create awards and named professorships that provide research support for outstanding teachers; require excellence in teaching for promotion; create teaching discussion groups; create cross disciplinary programs in college-level learning; provide ongoing support for effective science teaching; and, engage chairs, deans and presidents.

Henderson, Beach and Finkelstein (2011) examined a wide range of articles on change and found that STEM disciplines each operate more or less independently of one-another and that each has their own distinct perspectives and strategies about change. Based on their review, they conclude that two commonly used changes strategies (developing and testing curricular materials and then making these materials available to other faculty and "top-down" policy-making meant to influence instructional practices) do not work. What does appear to work are strategies that assume the importance of addressing the beliefs of individuals involved at the department specific level; involve sustained dialogue (i.e., a semester, a year, and longer); and strategic efforts that are institution specific (Henderson, Beach, and Finkelstein 2011).

Faculty members often struggle between dual loyalties: to their disciplinary and institutional cultures (Manduca 2008). Such challenges to innovation at the department level encourage concrete linkages to initiatives that bring together disciplinary and institutional goals such as discipline-based educational research (DBER) and peer observation.

In 2012, the National Research Council published *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*. Highlighting the importance of DBER as an investigation of learning and teaching from the discipline's priorities, worldview, knowledge, and practices. Further, it links excellence in teaching with excellence in research, likening DBER as complementary to research on learning and cognition with a focus on improved learning. While Physics has been a leader in pioneering discipline-based education research, Chemistry, Biology, Engineering, Mathematics, Astronomy and Geosciences are quickly gaining ground with similar discipline-based education research initiatives (MacIsaac and Falconer 2002, Manduca 2008, National Research Council 2012). Linked with these efforts has been the

emergence of increased scholarship on teaching and learning in STEM disciplines (Streveler, Borrego, and Smith 2006).

Another initiative to bridge disciplinary and departmental priorities for innovation and change is the Center for the Integration of Research, Teaching and Learning Network (CIRTL), a National Science Foundation Center for Learning and Teaching in Higher Education. CIRTL is a national network of 23 research universities that seek to enhance excellence in undergraduate education for diverse students through the development of a faculty committed to the dissemination and implementation of evidence-based teaching methods and practices. The diversity of the membership (i.e., private/public, large/moderate size, majority-/minority-serving, and by geographic location) further supports participation goals and contributions tailored to institution-specific needs (CIRTL 2014).

Research on the influences of pedagogical professional development of instructional practices demonstrates the importance of changing instructors' teaching conceptions in order to alter behaviors favorably (Ebert-May et al. 2011). Peer observation of teaching offers another promising method for the diffusion of innovation in teaching. Largely developmental, this involves collegial activities that enable teaching professionals to offer mutual support by observing each other's teaching, provide feedback, and collaboratively reflect on teaching effectiveness (Bell 2005). With such opportunities, departments can positively support and reward members engaged with new pedagogical strategies, course redesign, and other learning improvement measures.

4. Building a Course Level Climate to Support Innovation

While many faculty members confirm an interest in improving learning, they face constant obstacles to overcome in the process, including ever-increasing demands on time, lack of training, and tensions with professional identity (Brownell and Tanner 2012). Traditionally, profess-sional identity may be more closely tied to recognition for research publications than teaching. In order to be ready for change, instructors

must also resolve widely held misconceptions they have been socialized into such as: one can be a great researcher *or* a great teacher; great teaching is an essential quality (i.e., people are born great teachers); teachers who are well-regarded by their students amount to entertainers; and, the proper faculty role is the expert "sage on the stage".

Faculty ambivalence towards innovation may look like resistance to change but it can also be a call for innovation champions to substantiate why their colleagues ought to dedicate effort and time to modestly rewarded tasks. Research on the influences of pedagogical professional development on instructional practices has demonstrated the importance of changing instructors' teaching conceptions in order to alter behaviors (Henderson and Dancy 2007).

Course level change efforts must also give greater attention to the changing profile of the undergraduate student. Teaching is essentially a social experience and student expectations and perceived satisfaction levels may directly or indirectly influence faculty willingness to risk innovation. The annual Cooperative Institutional Research Program (CIRP) Freshman Survey indicates the constantly changing profile of expectations and pressures experienced by entering first year students indicating a wide variance in prior learning experience and readiness to engage in a scholarly environment (Eagan, Lozano, Hurtado, and Case 2013).

Rogers (2003) offers a useful overview of five key steps individuals traverse in the process of reflecting on whether or not to adopt innovations. These steps are: knowledge (becoming educated about the innovation); persuasion (development of a perspective on the possible advantages of the innovation including such attributes as compatibility, complexity, trialability, and observability); initial decision (to adopt/reject the innovation); implementation (experimentation and application); and, finally, confirmation (continue with process of adoption or reject it). Such a framework can be helpful in understanding the individual processes involved in adopting change in addition to the broader aggregate group stages described above (Sahin 2006).

One strategic benefit of the current press towards a culture of

assessment is the push towards course design, implementation, and assessment that is transparently built on explicit learning outcome goals, articulated evaluation measures, and learning activities that are accessibility-minded (Fink 2013). Such efforts to develop course and department-level learning outcomes creates a common language that crosses all departments within a university. Such a focus on learning allows instructors to demonstrate in objective, measurable, and transparent ways that learning has occurred in our students, and links to the university mission and accreditation standards (Anderson and Krathwohl 2001).

The enduring challenge of course-level change remains the gap between educational research on effective teaching strategies and faculty practices. Many faculty members remain unaware of the models and practices now available collectively referred to as evidence-based teaching methods (EBTMs) (PCAST 2012). EBTMs are pedagogical strategies indicated by research to have most impact on student learning (Buskist and Groccia 2011, Holdren and Lander 2012). Such strategies are methods supported by evidence derived from experimental learning research as well as from learning assessment in STEM courses (Handelsman et al. 2004). Evidence based teaching methods have proven effective with a wide range of class sizes and increase learning outcomes even as enhancements of traditional lectures. While there is no single method of teaching that works for all students across all subjects, EBTMs have a number of common features that determine what it takes to learn subject matter and acquire skills at the college level (PCAST 2012: 14). Such strategies include, for example, small group discussion; peer instruction; one-minute papers; using student response systems to encourage in class problem solving and assess students understanding; concept mapping; case studies; and, computer simulations and games. The PCAST Report (2012) offers a comprehensive list of such strategies annotated with related research studies.

5. Building a Centralized Unit to Support Innovation

A central dedicated unit with the expertise and resources to offer

centralized support to the entire community of instructors on campus is most likely to expedite the dissemination and implementation of evidence-based teaching and learning practices across an institution (Cook and Kaplan 2011, Gillespie and Robertson 2010).

A teaching and faculty development center alleviates the inconsistency of the interests, time, and resources available for such efforts from individual faculty members or department chairs. Such a center can herald innovative practices, exemplary teachers, and nurture a campus culture that rewards excellence in teaching. Centers offer a system wide approach and institutional memory that synergistically links campus wide, departmental, and disciplinary initiatives to institutional goals (Cook, Sorcinelli, and Sorenson 2003).

Such units offer confidential, developmental services and work with instructors from across the career span and disciplines because there are attributes of good teaching that are interdisciplinary as well as discipline specific. Centers generally avoid participation in faculty review and evaluation to confirm their role as a neutral third party. With this promise of confidentiality, centers can offer a full range of individual consultation and department consultation programs; services that would be cost and time prohibitive to support in every department. Most importantly, centers offer multiple developmentally appropriate points of entry for faculty exploring practices in teaching and learning and facilitate the kinds of sustained opportunities for dialogue, exploration, and innovation recommended by Rogers (2003).

Finally, centers link institutions to national and international education research and evidence-based practices in teaching. In recent years, the contributions of such centers has become so clear that it has led to significant growth in national and international educational and faculty development organizations. Selected examples include the Professional and Organizational Development Network /POD (United States), International Consortium of Educational Developers / ICED (global), The Higher Education Research and Development Society of Australasia / HERDSA (Australia and Asia), Japan Association for Educational Development in Higher Education / JAED (Japan), Society for Teaching

and Learning in Higher Education / STLHE (Canada), Staff and Educational Development Association / SEDA (United Kingdom), and the All Ireland Society for Higher Education / AISHE (Ireland).

To create a real and sustainable diffusion of innovations in learning and teaching at the institutional, department and course levels requires a contextualized approach that acknowledges the unique complexity of each higher education institution, departments and disciplinary associations as often equally significant to faculty. Furthermore, must find adequate rewards such as funds, awards, collegiality, and appropriate credit in evaluation processes for excellent teaching, that honors and respect individual change processes. Teaching and faculty development units leverage centralized resources and pedagogical experts to support innovation. Centers can do this by introducing instructors to research and evidence-based pedagogical strategies and opportunities to adapt and apply these to their course goals and students as appropriate. Centers facilitate sustained collegial dialogues and faculty learning communities based on shared interests, offering opportunities to explore essential issues in how people learn, practice new strategies in a low risk environment, and support mechanisms to access formative feedback from students and peers (Rogers 2003). Lee (2011) suggests that this embrace of international engagement may be the ultimate expression of educational development.

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教育改革に向けた全学的アプローチ

マシュー・ローレンス・ウォーレット

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米国における教育学研究の知見が示す大学教育における効果的な教授法と、実際の教室において実践されている教授法の間に差異が生じていると指摘する研究がある。本稿では教育に対する学内文化を変革していく上で求められるシステム的なアプローチについて論じる。さらに、エビデンスベーストな大学教授法の実践と普及を進める上で、教育開発部門がどのようにシステム的なアプローチの推進に貢献できるかを論じる。

ウェイン州立大学・筆頭副学長補佐、教育・学習センター長
名古屋大学高等教育研究センター・客員准教授