Responding to Administrative Priorities

Removing Barriers to Acceptance of Educational Innovations By Fostering Positive Relationships Between Researchers and Practitioners

Capsule: Some of the barriers to the implementation of educational innovations among university physics faculty can be found in the nature of relationships between physics educational research practitioners and other faculty. Similar relationships likely exist among engineering education researchers and other faculty in schools of engineering. Administrators seeking to transform curricula and instructional practices according to the recommendations of various reports are advised to address the nature of these relationships in order to mitigate factors which could potentially sabotage the process, such as marginalization of participants and their contributions.

Summary: Henderson and Dancy (2008) investigate reasons for the perceived low level of adoption of advances in physics educational research (PER) and associated practices among university physics faculty, observing that despite feedback from students and reports by distinguished committees, traditional methods of instruction seem to continue to predominate. Qualitative data regarding attitudes on and experiences with collaborations with PER practitioners are gathered through interviews with five professors purposefully chosen as being representative of faculty who are likely to be willing consumers of educational innovations. Analysis of the semistructured, exploratory conversations indicates that while faculty are generally responsive to PER findings, they are selective as to the research they incorporate into their instructional practices and they may not even implement effective methods due to perceived situational constraints such as amount of material to cover. Generally unsatisfactory collaborations with PER practitioners are also reported. PER practitioners are characterized as expecting faculty to adopt their innovations with minimal change and investigation, while faculty would prefer a more collaborative model in which both parties develop an instructional strategy based in the research but modified to meet individual situations. As a result of past experiences, faculty are likely to reinvent selected parts of instructional models from educational research and further invent practices to accommodate available resources on their own, thereby often duplicating earlier efforts by PER practitioners. This appropriation-reinvention-invention cycle may lead to frustration on both sides.

Based on these findings, barriers to the full dissemination of innovations in educational practices exist in four categories of faculty perceptions: that PER practitioners are dogmatic, more interested in promoting certain innovations than the needs of faculty and students; that PER practitioners are inappropriately judgmental of their use of "traditional" instructional techniques; that educational research methodologies are flawed and results are non-validating; and that they are disenfranchised from change initiatives by being left out of the research process (pp. 85 – 87). The authors offer five recommendations for barrier mitigation: that PER practitioners should provide easily modifiable instructional materials to support customized implementations; provide faculty with the research ideas on which innovations are based to promote understanding of the "why" in addition to the "what"; investigate a range of implementation environments to ensure that an innovation is sufficiently robust to work in a variety of situations; foster partnerships with faculty; and, through the acknowledgment that change is difficult, support instructors in clearing situational constraints hindering implementation of innovations instead of erecting additional barriers (pp. 88 – 89).

Implications for Engineering Education: Similar unproductive relationships between educational researchers and other faculty can be found in schools of engineering, which may be a contributing factor to the slow rate of curricular transformation in some programs. Faculty highly invested in traditional pedagogies and curricula may have formidable barriers to innovation to overcome. The investments can be reinforced by factors such as accreditation practices seen as favoring traditional curricula, and institutional cultures which value "hard"

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research over teaching – and, by extension, over the perceived "soft" nature of educational research – and distribute rewards such as tenure accordingly. The existence of these barriers is revalidated in the latest "call to action" with respect to the need to transform undergraduate engineering education, Sheppard, *et al*. (2008). *Educating Engineers* reports on the persistence of curricula emphasizing theory over practice seemingly in defiance of years of research on the more engaging nature of student-centered, active learning pedagogies. Administrators are important in the effort to realize the promise of these studies through leadership in supporting a school-wide culture supportive of educational innovation and developing and implementing policies rewarding changes in curricula and instructional practices. Key to the success of these initiatives is the establishment of mutually beneficial relationships between engineering education researchers and other faculty along the lines of the recommendations reported in Henderson and Dancy; leadership to encourage these relationships is likewise critical, especially if relationships have been contentious in the past.

Watson (2009) is another recent contribution regarding the complicated relationships that engineering education researchers can have with others in the process of change (or not) in curricula and instructional practices. Her two main observations are that "(r)esearch is necessary, but without translation into changes into faculty, courses, and curriculum, it will not produce called for changes" and "(a)ction, uninformed by research, has led to mistakes, wasted resources, and inadequate foundations for future efforts" (p. 3).

The content of the cited works outlines the equivocal position a researcher can have in the researcher – practitioner relationship. Practitioner expectations that the researcher's work have immediate relevance to their needs – expectations which are likely not experienced in any other research domain – are a potentially fruitful source of contention. Recognition that such expectations place education research and its practitioners in the awkward position of either being perceived as having little relevance and therefore can be justifiably ignored or being overly tied to practice and thus not focusing on developing the theoretical and methodological grounding that characterize other high quality fields of research helps in their management.

While the implied target of these works is undergraduate engineering education, the proposed recommendations would benefit graduate engineering education as well. For example, administrative encouragement of the adoption of collaborative learning principles in labs could help in mitigating sources of isolation inherent in a research-intensive atmosphere, thereby supporting student persistence.

References: Charles Henderson and Melissa H. Dancy (2008). "Physics Faculty and Educational Researchers: Divergent Expectations as Barriers to the Diffusion of Innovations." In the *American Journal of Physics* 76(1), January 2008, pp. 79 – 91.

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