AC 2010-260: ENGINEERING FACULTY AS ACADEMIC CHANGE LEADERS

Elizabeth Cady, National Academy of Engineering

Norman Fortenberry, National Academy of Engineering

Beverly Davenport Sypher, Purdue University
   Butler Center for Leadership Excellence, Purdue University

Steven R. Abel, Purdue University
   School of Pharmacy and Pharmaceutical Sciences, Purdue University

Monica Cox, Purdue University
   Department of Engineering Education, Purdue University

Teri Reed-Rhoads, Purdue University
   Department of Engineering Education, Purdue University

Brenda Berkelaar, Purdue University
   Department of Communication, Purdue University
Engineering Faculty As Academic Change Leaders

Abstract

Most stakeholders in engineering industry and education agree that change is needed in engineering education in order to improve the quality of instruction and produce engineering graduates with a wide range of skills. However, despite this consensus and several efforts to implement change, the accomplishments of the past 20 years have not met expectations. Thus, we aim to develop a nationwide program to help engineering faculty members develop change leadership skills. In support of this goal, we held a collaborative workshop to engage engineering faculty and administrators in a conversation about effective ways of implementing campus change or developing programs that lead to change. Attendees discussed institutional and departmental challenges; the knowledge, skills, and abilities (KSAs) needed to affect change; and methods of motivating other faculty members to develop those KSAs. In addition, the attendees presented examples of their own successes and failures in implementing change. We strove to gain information from the experiences of change leaders in attendance in order to help frame an implementable program for developing change leadership skills. Attendees provided feedback both in person and through an online post-workshop survey. All attendees were expected to develop and execute related plans on their home campuses and to report on those activities. We had expected that these on-campus plans would relate to explicating and validating incentives to engage faculty to acquire change leadership skills. While some did, many served to engage faculty in specific change leadership activities without necessarily explicitly highlighting the leadership skills being gained as a result of engaging in the activity. This paper will summarize the lessons learned from the application process, the workshop, and the campus plan activities.

Introduction

Most stakeholders in engineering industry and education agree that change is needed in engineering education in order to improve the quality of instruction and produce engineering graduates with a wide range of skills (e.g., 1, 2). Despite several calls to action, inertia remains in engineering schools and relatively little has changed in the past 20 years. Innovation in engineering education will require both faculty members and education researchers collaborate to work on and maintain change such that the practice of teaching informs engineering education research and vice versa. This change must be driven by faculty and administrators in engineering schools 3, which suggests that these individuals must gain the knowledge and develop the skills and abilities necessary to produce and support change. With this in mind, we held a workshop for representatives of engineering schools who have made significant changes. The goal of the workshop was to learn from these successful change leaders to inform our efforts at developing a broad program to aid engineering faculty members in developing the skills necessary to effect change.

Applications were solicited from senior engineering education leaders who represented a range of institution types. However, we allowed these leaders to bring campus teams, thus those in attendance also represented wide ranges of academic rank and of experience. Forty-one faculty members, representing 28 institutions attended. The institutional backgrounds of the attendees
included doctoral/research institutions (28), Bachelors/liberal arts colleges (7), graduate /Masters institutions (5), and community colleges (1). Years of experience ranged from less than 7 to more than 21, and the majority (23) of the attendees were professors. Another 3 were assistant professors, 4 were associate professors, 5 had other roles, and 6 did not indicate their position.

Workshop Activities

Participants received a notebook containing several readings prior to the workshop (see Appendix for list of readings). The workshop organizers planned several different activities for each of the topical sessions. The first session focused on identifying the challenges facing academic change leaders as well as identifying the knowledge, skills, and abilities (KSAs) necessary to address these challenges. The session began with individual brainstorming and then ideas were shared around the table so attendees could combine similar ideas and add new ones. These ideas were then shared with the entire group, and again similar ideas were combined. Once all ideas were on the table, the attendees did affinity exercises in which they each had five votes to use and could distribute them across ideas or use several on one idea. For example, two of the challenges identified as facing engineering educators were (1) underdeveloped administrative and faculty skills and (2) misalignment between vision and rewards. These two challenges were perceived as twice as important as the other challenges that were listed. The three most important KSAs identified to address these challenges were communication skills, knowledge of policies and procedures, pedagogy, technical aspects of one’s field, and change processes, and positive personal traits.

Attendees were then placed into groups of 4 – 5 individuals. These groups were asked to develop mind maps that visualized their assumptions on the future of engineering education. Attendees learned about failures and successes of each others’ on-campus activities via the jigsaw method, in which each person gives an example and the group developed a poster of all the examples and learned the details of each campus story embedded within the poster. Each person stood by the poster for several minutes while the rest of their group circulated to look at the other group’s posters and engage in discussions. The person staffing the poster was changed every few minutes so that each group member had the responsibility of representing their poster as well as the opportunity to visit other groups. After all members of each group had had an opportunity to view other groups’ posters, each group of 4-5 attendees received a list of 10 factors relating to the success or failure of any change initiative identified from the readings (strong leadership, institutional commitment, personal ownership, funding/budgets, visibility, shared change purpose, realistic targets/goals, schedules/timing, engagement, measurable benefits) that were printed on notecards and placed in a circle on a large piece of paper. As a group, they determined which were “outcomes” and which were “drivers” of success/failure and drew arrows between each pair of words so one was an outcome and one was a driver. Arrows going to the card indicated that word was an outcome, while arrows going away from the card indicated a driver. Counting the number of arrows on each group’s paper led to a list of the key drivers (most outgoing arrows) and outcomes (most incoming arrows). Across all the groups, the key driver for sustaining change was strong leadership, while setting realistic targets or goals, funding, and institutional commitment were also seen as drivers. The key outcomes of sustaining change were powerful engagement, visibility, and schedule/timing.
Originally we had planned activities focused on (1) identifying the challenges faced by academic engineering leaders, (2) identifying the knowledge, skills, and abilities required to address those challenges, (3) engaging in a leadership development exercise, (4) identifying likely on-campus change agents, (5) determining how to motivate and recruit the on-campus change agents, (6) determining the parameters for a formal program of study, (7) determining how to make a formal program of study sustainable, and (8) developing specific plans for attendees to engage in on their home campuses.

However, before the activity to discuss motivation, several of those in attendance requested a revision of the agenda to better showcase the knowledge resident among the attendees. Therefore, we reformulated the agenda to repeat steps (1) and (2) above but this time reframed as (1A) identifying what specific challenges those in attendance have addressed, (2A) identifying what knowledge those in attendance have that help to address these challenges. We then did a jigsaw exercise where people in groups learned (3A) of the successes that others in their group wanted to share and then rotated people around the room to learn of the various success stories across groups, and (4A) what are the translatable lessons learned that apply across the various specific situations identified. We ended by doing an exercise tied to the literature on key determinants of change implementation success (what key factors are most critical and in what order should they be addressed).

An important challenge we faced was disagreement among those who wanted to know how to operate with the current system as it exists and those who wanted to focus on how to change the entire system. Each is a valid goal, but given the varying levels of investment in the current system, we chose to focus on the former (operating within the current system).

Workshop Evaluation

Attendees completed surveys before and after the workshop and also evaluated the workshop via online survey. The evaluation first asked attendees to rate the importance of the topics of each planned session as well as the effectiveness of each session. Results are presented in Table 1.

Table 1: Evaluation ratings (25 total respondents).

<table>
<thead>
<tr>
<th>Topic</th>
<th>Very Important or Important</th>
<th>Very Effective or Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenges before academic engineering educators</td>
<td>88%</td>
<td>64%</td>
</tr>
<tr>
<td>Knowledge, skills, and abilities needed to surmount the challenges</td>
<td>84%</td>
<td>52%</td>
</tr>
<tr>
<td>Change leadership development</td>
<td>96%</td>
<td>36%</td>
</tr>
<tr>
<td>Recruitment: Identifying likely faculty change agents</td>
<td>64%</td>
<td>40%</td>
</tr>
</tbody>
</table>
Table 1 (Continued): Evaluation ratings (25 total respondents).

<table>
<thead>
<tr>
<th></th>
<th>Very Important or Important</th>
<th>Very Effective or Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment: Motivation</td>
<td>64%</td>
<td>44%</td>
</tr>
<tr>
<td>Delivery: Instructional design</td>
<td>48%</td>
<td>28%</td>
</tr>
<tr>
<td>Delivery: Sustainability</td>
<td>76%</td>
<td>40%</td>
</tr>
<tr>
<td>Campus Activity Plans</td>
<td>60%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Eighteen of the attendees rated the networking opportunities as the most useful part of the workshop. Closely related to this (and cited by 12 responses) were the sharing of information and learning new information from others. The most significant area for suggested improvement (13 responses) was to have more sharing of examples and other discussions among the attendees.

Pre-Post Surveys

In addition to the workshop evaluation, the attendees completed surveys before and after the workshop. Several of the questions in both surveys related to attending and paying for either a workshop or a certificate program in leadership. Although we had originally thought that a certificate program might provide an attractive mechanism for enhancing and incentivizing faculty knowledge of change management, this option was rejected with near unanimity by the attendees. Workshops were slightly more popular (see Table 2) but overall the attendees preferred informal peer-to-peer sharing and case studies to more formal experiences.

Table 2. Willingness to attend or pay for workshops or certificate programs in leadership (25 total respondents).

<table>
<thead>
<tr>
<th>Would you be willing to:</th>
<th>On Campus</th>
<th>Off Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Attend workshop</td>
<td>88%</td>
<td>72%</td>
</tr>
<tr>
<td>Pay for workshop</td>
<td>50%</td>
<td>44%</td>
</tr>
<tr>
<td>Encourage others to attend workshop</td>
<td>100%</td>
<td>88%</td>
</tr>
<tr>
<td>Pay for others to attend workshop</td>
<td>96%</td>
<td>68%</td>
</tr>
<tr>
<td>Attend certificate program</td>
<td>50%</td>
<td>20%</td>
</tr>
</tbody>
</table>
Table 2 (Continued). Willingness to attend or pay for workshops or certificate programs in leadership (25 total respondents).

<table>
<thead>
<tr>
<th>Would you be willing to:</th>
<th>On Campus</th>
<th></th>
<th>Off Campus</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Pay for certificate program</td>
<td>31%</td>
<td>8%</td>
<td>31%</td>
<td>4%</td>
</tr>
<tr>
<td>Encourage others to attend certificate program</td>
<td>54%</td>
<td>4%</td>
<td>35%</td>
<td>0%</td>
</tr>
<tr>
<td>Pay for others to attend certificate program</td>
<td>46%</td>
<td>4%</td>
<td>31%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Discussion

Although we had expected that applicants would readily understand and concur with our desire to distill project-independent change leadership strategies which could be transmitted to others, most attendees preferred grounding their change leadership skills in specific examples and case studies that contextualized the strategies pursued. However, this same contextualization raised questions about what subset of strategies might be validly pursued in different contexts.

On the assumption that our primary audience for leadership skills development would want some tangible recognition of a program of study leading to knowledge acquisition, we had anticipated attendees would recommend the design and implementation of a certificate program that could be offered through one or more academic institutions. However, they explicitly and emphatically rejected this option and much preferred knowledge acquisition via informal interpersonal mechanisms. There was also a slight preference for expert-led workshops, with a generic agenda as follows:

1. What challenges do you want to address?
2. Categorize the challenges with respect to type of change to be implemented
   a. Level of aggregation -- course level, dept level, college level
   b. Focus -- interpersonal, content, pedagogy, etc.
3. What success or failure stories do you have to share that give "lessons learned"?
4. What levels apply to which types of change?
5. Are there specific lessons that are generalizable across either levels of aggregation or foci (e.g., need to engage skeptics before can implement a new program)?
6. How do these specific lessons tie back to the extensive change literature?
7. How can we use the specific engineering lessons to engage engineering faculty in learning the more generic change literature so that they do not have to re-invent the wheel?
8. How do we codify and institutionalize the strategies identified in 6?

All attendees are expected to develop and execute related plans on their home campuses and to report on those activities. We had expected that these on-campus plans would relate to explicating and validating incentives to engage faculty to acquire change leadership skills. While some did, many served to engage faculty in specific change leadership activities without necessarily explicitly highlighting the leadership skills being gained as a result of engaging in the activity.
On one campus which did explicitly address faculty incentives, there was strong agreement among the faculty interviewed that the useful incentives for participating in a program to learn change management skills include:

- Assistance in achieving the specific change being sought by the attendee,
- High perceived utility and productivity of the program to be offered,
- An opportunity to interact with those who have successfully initiated changes in academia, preferably such changes should be comparable to those being considered by the would-be attendee,
- Provision of an opportunity for sustained interactions with other faculty engaging in change processes,
- Accrual of prestige as a result of a high level invitation to participate in the process of learning change management and/or the participation of prestigious personages, and
- Provision by the faculty members’ institution of time to implement the projected change.

Bibliography

Appendix

List of pre-workshop readings (print copies were provided to workshop attendees)

Required

[Executive Summary Only]

Optional