



Work-in-Progress: Engineers Transitioning from an Industrial Position to Full-time Academic Position in an Engineering College

Matthew Lucian Alexander (Associate Professor)

Dr. Matthew is an associate professor in Chemical Engineering at Texas A&M University-Kingsville

NAZMUL RAHMANI

Dr. Nazmul Rahmani, Texas A&M University - Kingsville Dr. Rahmani is the Van Mooney Professor of Practice in the Department of Chemical and Natural Gas Engineering at TAMUK. Prior to this, he had 12+ years' experience in petroleum industry with major focus on process engineering design and laboratory R&D project management. He received PhD, MSc and BSc in Chemical Engineering from University of Alberta (UofA), University of North Dakota (UND), and Bangladesh University of Engineering and Technology (BUET), respectively.

Work-in-Progress: Engineers Transitioning from an Industrial Position to Full-time Academic Position in an Engineering College

Abstract

This Work-in-Progress paper presents some unique challenges an engineer may face in transitioning to a full-time academic position into an ABET-accredited College of Engineering from an industry position, and the findings are based on survey of a limited number of faculty who have made this transition. The intent of the effort presented in this paper is to lay the foundation for a more extensive future survey of the unique challenges the professionals face in making this career change, and to obtain feedback from other engineering faculty in the US who view this transition as a unique challenge. The authors' personal experience indicates that this transition involves factors beyond the adjustment to teaching as a primary activity, including aspects such as rethinking one's client base, adjusting to research in an academic environment as compared to an industrial environment, and managing numerous goals and time demands posed from various university sources. The survey results indicated a number of similarities amongst the nine respondents, as well as a few unexpected results that are discussed in this paper. These results, along with discussions that will arise from the presentation of this paper at the conference, will serve our future expansion and development and dissemination of this survey that targets faculty in Hispanic-serving institutions.

Introduction

This Work-in-Progress paper presents preliminary insights into factors facing engineering industry personnel who change their career path to a full-time academic position at an ABET-accredited College of Engineering. The motivation for this Work-in-Progress paper is to share with other engineers considering such a career change some of the unique challenges they may face in transitioning from industry to academia, based upon the recent experiences of surveyed faculty who have completed this transition successfully. This preliminary work is intended to seek feedback that will be helpful for expanding this work to a more extensive survey of faculty that fit this category. The most obvious challenge is the adjustment to teaching rather than working in an engineering production, design, or consulting environment for industry. However, the information presented here includes a myriad of challenges beyond teaching, including developing an academic research program through direction of graduate work, and satisfying the various professional development, service, and research requirements expected of university professors [1, 2].

The three most common forms of full-time positions in engineering colleges are the tenure-track, professor of practice, and teaching only positions. While the tenure-track position usually requires a mix of teaching and research effort on the part of the professor, the professor of practice typically requires teaching only. The development and presentation of teaching material, classroom management, and assessments of homework assignments, reports, and exams are the initial challenges that new transplants face [3]. New academic professionals are typically assigned a greater variety of courses to teach once they have been successfully teaching full-time for a year. Adjustment to teaching is facilitated if the instructor adopts a mindset that university students are their client, and graduates are their final product.

There are experiences and skills developed from working in industry that can help a new faculty member in transitioning to an academic position [2, 4]. These include flexibility, trying new things, having an enthusiastic attitude, and effective time management [5]. Conversely, there are certain skills that could be helpful to a new academic that are not likely to have been developed while in an industrial position [3]. These skills or experiences include motivating students to learn, assisting struggling students, effective course planning and delivery, starting an independent research program, obtaining external funding, writing rigorous assignments and tests, handling students in the classroom, student recruitment, and collaborating with other faculty members [2, 4]. With all the myriad demands of a full-time academic position, work-life balance can be a major stressor for new faculty [5]. Other stressors may include mastering teaching skills, allotting time for research, infrequent feedback on performance, and lack of experienced peer faculty that are willing to mentor new faculty [2]. For a transitioning tenure-track faculty member, the learning curve can be steep. A significant challenge is posed by the task of creating a research program that can attract external grant funding, train students in the scientific method and appropriate investigative techniques, and generate new scientific information that can be published in peer reviewed journals within a reasonable period by the faculty member [5].

This Work-in-Progress paper presents the results of a brief survey conducted with a small collection of faculty members that are transfers from industry to academia (mostly faculty in Hispanic serving institutions in the southern US) in the mid- or mid-late portion of their professional career. The authors' university, Texas A&M University-Kingsville (TAMUK), is a Hispanic majority university. One of the primary challenges that Hispanic undergraduate students in STEM face is the lack of good role models, thus one focus of this survey, as intended for future implementation, is surveying of Hispanic faculty on this particular transition topic. Other literature on this particular topic has focused on sub-groups such as women, however little has been found in the literature on this particular STEM faculty topic related to Hispanic-serving institutions or Hispanic majority institutions, thus making this survey effort a unique contribution. The objective in conducting this survey is to create resultant data that can be used as a guide in the future development of a more robust and extensive faculty survey, to also include respondent interviews, on this topic with significantly more participants, and thus this paper solicits feedback to help guide the future effort. The information obtained from this survey may also be useful to College of Engineering leadership when conducting faculty searches and completing negotiations with prospective faculty hires.

Methods

A survey on the topic of industry-to-academia transition experience for engineering professionals was developed by the authors, specifically focused on assessing faculty at Hispanic-serving institutions (HSI). The intent of the authors was to obtain feedback about this transition from peer academics who had spent at least five to ten years in industry prior to their transition to academia, and had now been in academia for at least three to five years. The authors asked peer academics in engineering to complete this survey and return it to the authors for evaluation, without including their identity on the response. Six of the nine respondents to this survey were engineering faculty from TAMUK (a Hispanic-serving institution, as well as having a majority Hispanic undergraduate student population), and two of the respondents were professors of

practice, rather than tenure track faculty. The authors' HSI university is located in a Hispanic/Latinx majority area of Texas. Two of the nine respondents were Hispanic/Latinx (roughly 20 percent), which is a level that is similar but somewhat greater than the level of Hispanic/Latinx on the engineering faculty in our college, which is roughly 15 percent. Two of the three faculty respondents that were not from authors' university were from other regional HSI universities and all three of them were tenure-track faculty.

The survey consisted of five questions, each with multiple answers. The respondents were asked to mark each question with all answers that applied in their particular case. The five questions and their multiple-choice answers are presented below. A number of the aspects listed in questions 2 and 3 are the same or similar to other authors who have investigated the issue of industrial engineering professionals transitioning to an academic position [1-3, 5]. Additionally, other researchers have evaluated the importance of peer networking (question 4) in such a transition [1, 5].

1. What was it that motivated you personally to make the transition from industry to academia?
 - a. Interest in teaching as full-time employment
 - b. Desire to conduct research that is self-determined
 - c. Peer pressure or competitiveness in the industry
 - d. Opportunity to work alone, whereas industry requires to work in a team and collaborate with people on projects
 - e. Need to pick up new skills more often as industry focuses on developing solutions or products
 - f. The uncertainty in the industrial R&D job market

2. What items helped you personally in making this transition effectively?
 - a. Past experience part-time or adjunct teaching
 - b. Teaching experience during grad program
 - c. You were prepared, focused and driven
 - d. Internal reflection and self-discovery
 - e. Reduced teaching load in first semester
 - f. Start-up fund for research
 - g. Mentor program to ease transition
 - h. Teaching workshops

3. What was the greatest challenge you faced when you transitioned from full time industry to full time academia?
 - a. Salary change
 - b. Managing a dual career with spouse
 - c. Adjustment to the teaching load
 - d. A shift in the work culture
 - e. Endeavor to create a research program
 - f. Developing a change in mindset
 - g. Time management
 - h. Work-Life Balance
 - i. Insufficient resources or inadequate recognition
 - j. Classroom engagement and student management

4. Was networking with your academic peers in the early stages of your transition to academic helpful? Yes or no.
What networking was helpful to you?
 - a. Faculty in your department
 - b. Faculty outside your department
 - c. Faculty at other universities

5. Were you able to readily adapt to research in the academic environment as compared to research you may have done in the industrial environment?
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree

Results

The results of the industry to academia survey from nine respondents are presented in individual graphs in Figures 1 to 5 below. In all five questions, the respondents were encouraged to select more than one answer if applicable. The first question delved into the reasons that engineering faculty indicated for their motivation to transition from an industry to an academic professional position. The result with highest frequency (n=9) was “interest in teaching”. The other high frequency results coincide with findings of Volkamer and Riniker [5] (“uncertainty in the industry job market” (n=7), desire to conduct self-directed research” (n=3)). The first highest response is an internal driver, likely spurred by positive experiences with one’s own doctoral advisor or other close faculty mentors in graduate school. Conversely, the second highest response is the opposite, namely it is essentially an external driver that can be associated with industrial down-sizing or industries moving overseas that has occurred across the US over the last 10 to 20 years.

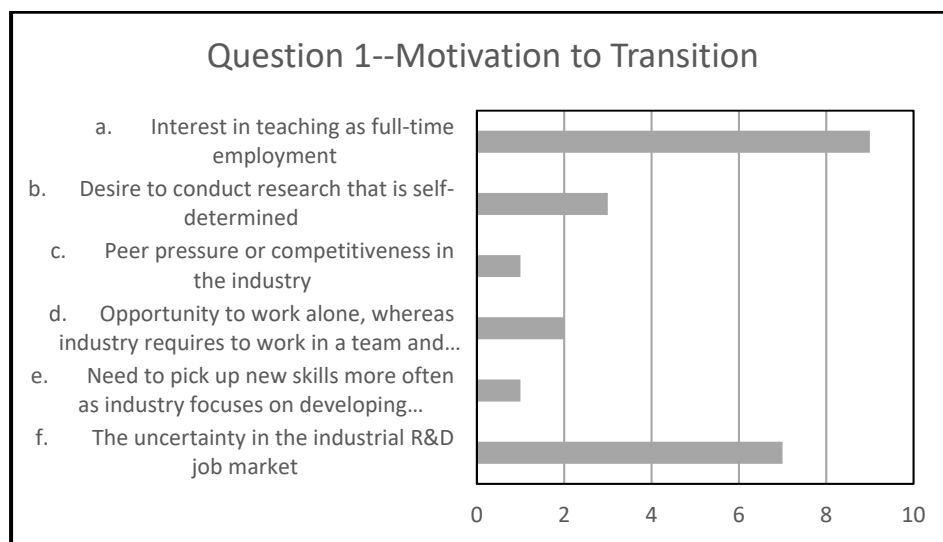


Figure 1. Responses to survey question #1

The second question was intended to shed light on identifying those past experiences, internal feelings, or new academic position circumstances that helped the respondent make the transition to academia with less difficulty. Of the five higher frequency responses, two were directly similar to the finding as Volkamer and Riniker [5], namely the “prepared, focused, and driven” (n=4) and “reflection and self-discovery” (n=3). These two responses reflect self-motivation or internal drivers. Other high frequency responses were consistent with faculty having prior part-time or adjunct teaching experience at a university or a community college (n=6), and would certainly help in this transition. A total of 24 responses to this question were provided by the nine respondents, which is close to three responses per person. The first four responses (a-d) could be categorized as past-experience or internally-driven items, while the latter four responses (e-h) are clearly opportunities offered to new faculty by the university employer. In total, there were 14 responses on the first four items and ten responses on the last four. All nine respondents had one or more items selected on the first four, while only five respondents had one or more items selected on the last four. These numbers suggest more internal motivation or self-reliance on making the industry to academia transition, while slightly more than half the group indicated reliance on a mix of internal and new employer items. One interesting aspect of this result shows that no respondents chose the “mentor program to ease transition” as a choice, which was also a challenge noted by Banik [6]. It implies that engineering colleges are lacking in mentor programs that could ease the career transition of a newcomer to that higher education environment. In particular, the authors’ College of Engineering does not have a formal mentoring program for new full-time faculty hires, and so any new faculty mentoring that does occur is adhoc. Conversely, many industrial companies have a strong mentoring program for professionals coming onboard to that organization.

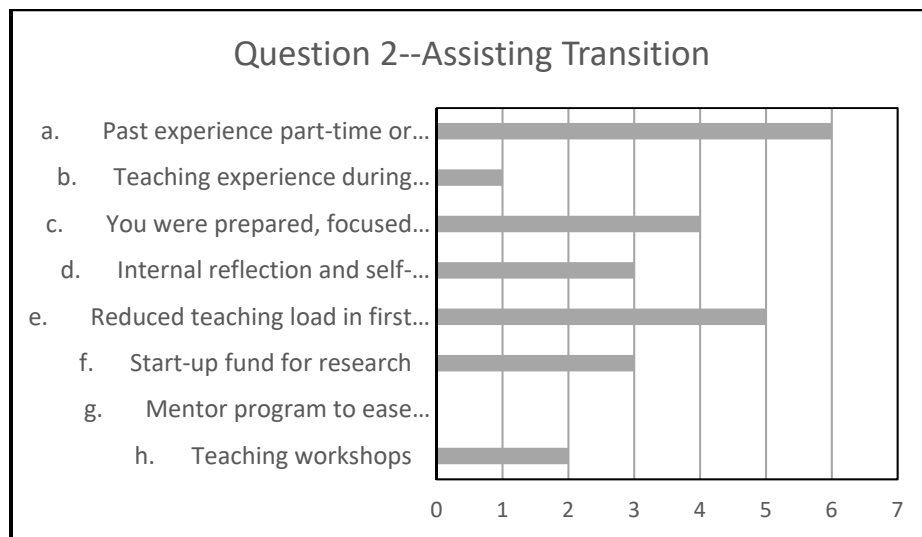


Figure 2. Responses to survey question #2

The third question looked at what challenges each respondent faced in the transition from an industry to an academic professional position. The highest frequency responses were “endeavor to create their research program” (n=6) and “salary change” and “insufficient resources / inadequate recognition” (both at n=5), which is consistent with the findings of Fleishman and Braun [3]. A total of 24 responses to this question were provided by the nine respondents, which

is close to three items per person. The first three responses (a, e, i) were clearly the main challenges in career transition, as they represented 16 of the 24 responses overall.

There is a fundamental difference in research and proposal writing approaches between academic and industrial research [5], which is the likely cause for this particular aspect to be one of the greater challenges for new faculty from industry. The academic or scholarly researcher attempts to add value to a larger “body of knowledge” for a scientific or technological concept that is currently existing or anticipated to occur in near future. It uses formal and systematic procedures to discover answers to more conceptual questions and is guided by an already existing theory. Conversely, the industrial or applied research seeks to find solutions to current problems and issues that emerge from business requirements. It does not necessarily have to follow formal and systematic scientific procedures to find solutions to practical problems.

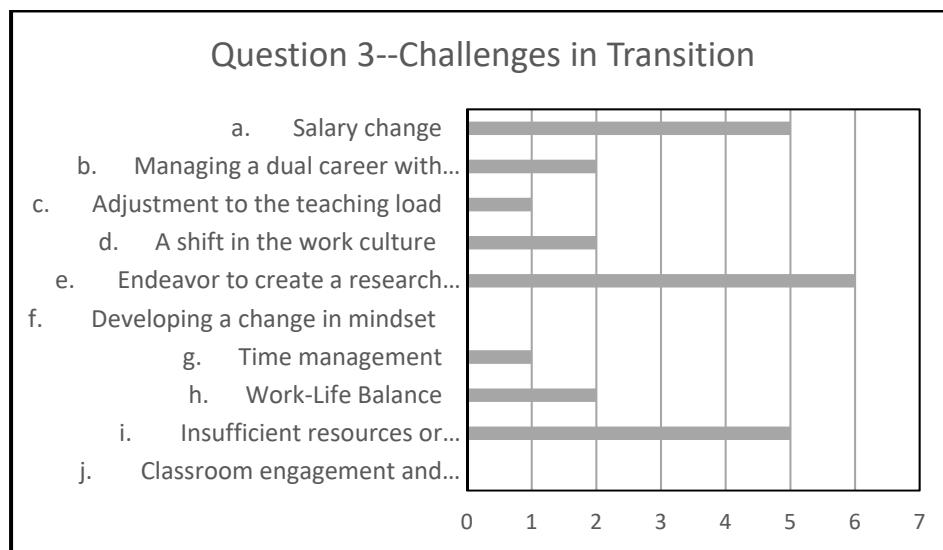


Figure 3. Responses to survey question #3

The fourth question was intended to assess networking as an element to making a successful transition from industry to academia. The first portion of the question asked whether respondents found networking to be helpful, and all respondents answered yes to this query. The second part of this question was intended to determine whether the respondent’s networking was with faculty in their own department, outside their department, or at other universities. This mix of responses about networking, with “within department” as the most frequent, seems to be a typical response from the perspective of proximity of the peers, as well as similarity in technical area. Other investigators touted the importance of networking with a variety of peers as important to thriving in the academic environment [1, 2, 5]. Since inter-university faculty research collaboration is favored or valued positively by the external funding agencies, the respondents seem to develop networking with faculties from other universities having similar research interests. A developed network of professors or administrators outside of one’s own department can be invaluable in successful navigation of the tenure portfolio development and review process [5].

Networking within one’s university, as well as with one’s professional society affiliates, is critical to academic career success. A full-time academic position requires performance and

excellence in prescribed proportions in four areas--teaching, research, professional development, and university service. Networking with one's peers regarding chosen activities in these four areas can be very helpful on one's path to tenure. One of the best ways to network effectively within the university is through a university-sponsored professional development program for new full-time faculty. This program can provide the professor with introductions to peers outside one's department with common research interests.

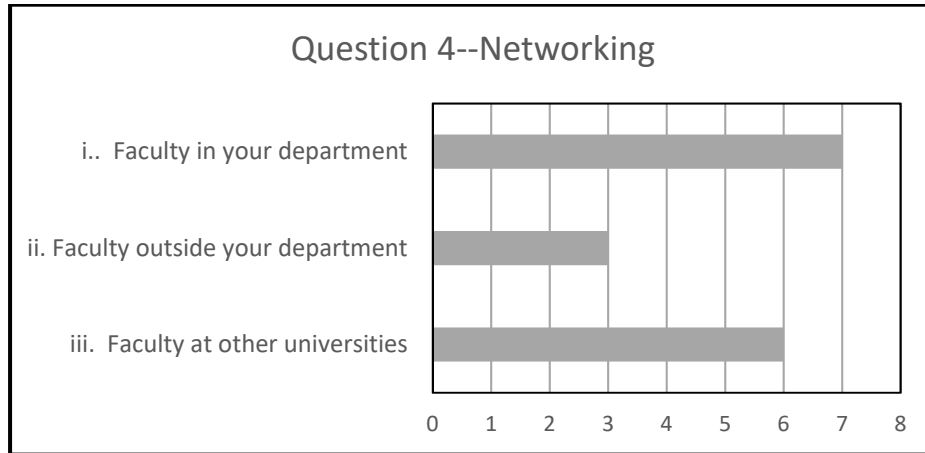


Figure 4. Responses to survey question #4

The fifth question delved into whether the respondent was able to adapt to the research environment required of university professors on tenure-track. Of eight respondents on this question, six strongly agreed or agreed, while the other two responded with either neutral or disagree.

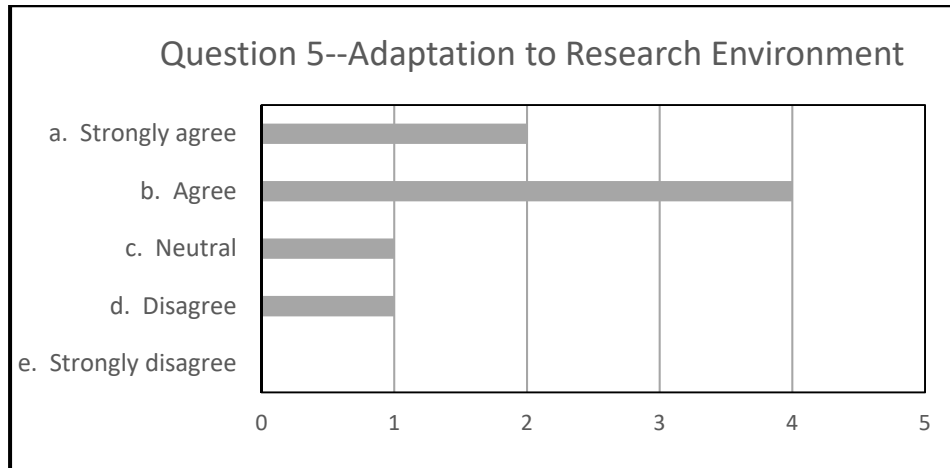


Figure 5. Responses to survey question #5

Summary and Conclusions

The results of this survey, intended as an initial or foundational survey, from nine engineering faculty representing four different universities indicate that a mix of both internal and external elements play a role in leading to a successful transition from industry to academia for PhD

engineers. In particular, the main driving forces of such a transition from this brief survey are indicated as self-interest and motivation to impart knowledge to others by teaching at the college level, and the uncertainty associated with the industrial job market. Secondly, the effort required to create an independent research program in academia is probably the most challenging aspect of this change for an engineer based on the respondents in our survey, followed next by adjusting to the change in salary associated with transition to academia. An unexpected result from the second survey question is the lack of any responses on faculty mentor programs as a means to ease or assist the industry to academia transition of faculty. Since the institution of most respondents in this survey is an HSI institution, aspects of the survey that may impact our majority Hispanic student population are of interest. One of the challenges that Hispanics face in successfully completing an undergraduate STEM degree is the lack of good mentors that are like themselves. This aspect directly relates to our survey, and in particular to responses from faculty that are Hispanic (n=2 in this case). The response regarding lack of faculty mentoring cited above leads to a research question that can be emphasized in the next version of this survey, namely the existence and participation of new faculty in a faculty mentoring program, and how such a program may impact the extent of faculty mentoring of Hispanic students in their academic path and career initiation upon graduation from a Hispanic majority institution. Therefore, future renditions of this survey should focus more closely on those aspects that would relate to Hispanics that are engineering faculty members who came from an industrial career, such as some of the options in questions 1 (motivation) and 2 (mentors). Finally, an important takeaway from our initial survey is that the transition can be made successfully for many engineering professionals, but it is not without its pitfalls and ongoing adjustments to an environment that is quite different than the industrial one from which they came. This preliminary work is intended to seek feedback from discussion with other professors at the conference that will be helpful for expanding this work to a more complete survey of faculty that fit this category, including Hispanic faculty at Hispanic-serving institutions.

References

- [1] C. Carrigan, Riskin, E. A., O'Leary, K., Yen, J., Mody-Pan, P.N., O'Donnell, M., "On-Ramping to Academia: Women's Experiences of Transitioning from Nonacademic to Academic Careers," presented at the ASEE Annual Conference and Exposition, 2015, 11492.
- [2] S. Parks, Dietz, L., "Mid-Career Change: Benefits and challenges of leaving industry for academia," presented at the ASEE Annual Conference and Exposition, 2017, Conference Paper ID # 18302.
- [3] S. Fleishman, Braun, J., "Caution! Rough Road Ahead – the Transition from Industry Professional to Engineering Educator," presented at the ASEE Annual Conference and Exposition, 2010.
- [4] W. Loendorf, "Transitioning from Industry to Education: The Third Year," presented at the ASEE Annual Conference & Exposition, Chicago, Illinois, 2006. [Online]. Available: <https://peer.asee.org/178>.
- [5] A. Volkamer, Riniker, S., "Transition from Academia to Industry and Back," *J. Chem. Inf. Model*, vol. 58, pp. 1469-1472, 2018.
- [6] G. Banik, "Strategies and Techniques for New Tenure-track Faculty to Become Successful in Academia," presented at the ASEE Annual Conference & Exposition, New Orleans, Louisiana, 2016. [Online]. Available: <https://peer.asee.org/25886>.