Improving practical knowledge of educators with cooperation of municipalities

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ABSTRACT

Undisputedly, there are many educators in the engineering and engineering technology fields that have superior academic and theoretical knowledge. This knowledge makes them well prepared for teaching students who want to go in to academia or research oriented careers, but may not make them as well prepared for those students which are planning on going into field engineering positions. Students that prefer the more practical careers may not relate well with the more theoretical professor, but instead, may prefer someone with more practical type experience that can relate the in class theory to industrial examples.

Unfortunately, many professors who excel at research and theoretical engineering have not had the experience of working in the types of jobs many of their students aspire to obtain, and may not be able to relate their knowledge in a manner that appeals to a majority of their students because of this lack of experience. One mechanism for obtaining this practical type experience is educators and municipalities working together for mutual benefit. Municipalities are often under tight budget constraints and cannot afford to hire more full-time engineering staff. However, municipalities could benefit greatly from theoretical knowledge that can be provided by an educator.

Educators benefit greatly from an arrangement where they can gain experience in practical engineering work. Depending on their university's regulations, they may even be able to work as a consultant throughout the academic year on a part-time basis. Municipalities can benefit from having an increase in technical knowledge and ability at a lower cost. There would be no benefits paid and even the most strapped municipal budget could afford a part-time employee that could yield significant savings resulting from increased technical expertise. One slight improvement suggested by the faculty member could save the municipality significant amounts of funding. Cooperation between the academic world and municipalities is a win-win situation for everyone, including the public.

INTRODUCTION

To become a university professor the credentials can vary widely. In most instances they include a Ph.D. for engineering programs and a masters degree and up to three years of

industrial experience for engineering technology programs[1]. Usually, a graduate degree is a sign of mastery of the technical and theoretical knowledge of a specific subject, however; a graduate degree is not necessarily indicative of practical professional knowledge.

Mastery of the technical and theoretical knowledge could prepare educators for a career in research or academia, but does not adequately prepare them for teaching students who may not relate to pure theory. Unfortunately, the trend of engineering education diverging from the actual practice of engineering has been widening since the 1950s[2]. Theory is an important aspect of engineering, but there must be some practical application included in the curriculum.

It is necessary to cater to the students who wish to pursue more practical type engineering jobs, because a majority of students do not go into pure research or academia. There is significant need to include practical experiences and components into the engineering curriculum[3]. Unfortunately many engineering educators do not have the necessary practical experience to relay this to their students or the practical experience the educators do possess has become outdated.

PREVALANCE OF LACK OF PRACTICAL EXPERIENCE

Once a professor has gained a faculty position it can be difficult to obtain new practical experience. Tenure-track faculty members are most concerned with meeting the requirements for tenure prescribed by their university. Most tenure requirements call for teaching, research, and service. In an ideal world faculty should perform work in all three areas[4]. Unfortunately, there is not as much emphasis placed on teaching at the undergraduate level, since universities are struggling to obtain funding from outside sources, which is most easily gained through privately funded outside research[4, 5]. This drive for external funding takes precedence over teaching and service, as well as staying up-to-date with the developments in the field.

The argument can be made that since industrial experience is required as a condition of gaining tenure in engineering technology programs, there is no lack of practical experience. This argument fails to acknowledge two distinct groups of educators: 1) new graduates who may not have the required experience at the beginning of their academic careers 2) educators that achieved tenure but have not worked in the profession in several years. The new graduates have very little practical experience to build from in the classroom. The more experienced educators have the possibility of become somewhat irrelevant over the course of their academic careers.
It has been determined that the half-life of an engineer is about five years[6, 7,8]. Faculty members who are several years removed from their industrial experience are possibly becoming outdated. There is a definite need for faculty of all experience levels to obtain practical experience in the field they are teaching. Outside consulting for faculty is a beneficial way to maintain technical competency, as well as a way to gain a greater feel

for what employers are looking for in new engineering or engineering technology graduates[9].

Many universities count on research to keep the skills of their faculty up-to-date[6]. This is a good model for universities with strong graduate programs and the ability to attract outside funding on a regular basis. However, many universities focus primarily on undergraduate education and may not have these same opportunities for cutting edge research[6]. There is need for another model for educators to gain practical experience while teaching, and outside consulting is a solution.

FACULTY INTERNSHIPS AS PRACTICAL EXPERIENCE

Faculty internships are an effective way for educators to gain the practical experience they need or to maintain currency in knowledge and skills[10]. There is no better learning environment than practicing the skills on a regular basis in a professional setting. Stepping away from the theory and actually applying the knowledge is an ideal learning environment for educators.

Benefits of a Faculty Internship

There are several benefits for faculty internships, including: professional development of the faculty, enhancing the public image of the university, enhancing the teaching ability of faculty, and providing a source of highly educated individuals for use by the profession.

Professional development benefits both the faculty member and the university. The professional development plan is a significant portion of tenure and promotion of faculty[9]. Engineering technology faculty can aspire to become professionally registered which not only makes them more desirable outside academia but also makes them more credible in the classroom when they are teaching[1]. If the tenured faculty has relevant and current experience, there is less need to rely on adjunct faculty to fill the void. This results in better coherency in the curriculum, because the faculty is better prepared to teach the current issues instead of hiring outside professionals for practical experience type courses.

Some students feel that faculty members should be practitioners in the field they are teaching[11]. Students are also interested in the environment in which they will be working and relating stories from consulting jobs helps motivate them in class[6, 11]. Student questions about "real-world" experiences can lead to discussions that could relate to professionalism and ethics, liability, and other non-technical issues[9]. Industrial experience and professional licensure is more important in undergraduate programs than in graduate programs[1]. This stems from the fact that many graduate students are migrating toward careers in academia and research, while the undergraduate counterparts are most often going into field engineering positions upon graduation.

The profession benefits from having highly educated individuals available as part of the workforce due to faculty internships. The main benefit that industry gain is having access to highly educated faculty that can help solve important industrial problems[12]. Some other benefits include industrial access to university facilities and information about new technologies[12].

The university, industry, students, and the faculty can all benefit from faculty internships. The university gains publicity as well as better-trained professionals teaching their courses. Industry gains knowledgeable problem solvers and talented engineers. Faculty gain some compensation and more importantly, current practical experience. Students benefit from the current practical experience that their professors gain through the faculty internships.

Drawbacks of a Faculty Internship

There are some drawbacks for faculty internships. University policies on outside employment, as well as promotion and tenure policies can hinder faculty internships[9, 10,12]. Time constraints can be a drawback for both the faculty member as well as the industrial partner in an internship. Compensation can also be a hindrance to the success of a faculty intern.

University policy on outside employment varies drastically. Some policies allow approximately one day per week to be dedicated to consulting work while classes are in session and others prohibit outside employment except during the summer terms. East Tennessee State University allows faculty to hold an outside position while teaching, but the faculty member's department chair must know and approve of the employment arrangement.

University promotion and tenure policies also can be a drawback to faculty internships. Some universities give more weight to publications, research, and outside grants for tenure and promotion, and significantly less weight to professional development[12]. These tenure and promotion policies tend to keep non-tenured faculty from participating in outside internships, unless the university is progressive enough to see the benefit for the university in these activities[10, 12].

Time constraints can be a significant drawback to both the faculty membership and the industry that would like to utilize faculty interns[12]. . The assigned duties of teaching courses, advising, service on department-level, college-level, and university-level committees do not leave much free time to engage in outside work. Couple those time constraints with the fact the university is generally pushing for outside research funding which also requires a significant dedication of time[12]. The industry partner can also have reservations about utilizing faculty interns because of their limited availability. It is difficult to make full use of the faculty member's skills if they are only available for short periods of time. Not all types of industry are suited to this part-time status of faculty interns.

Compensation is also another factor that can be a drawback for faculty internships. Most faculty can receive more compensation from being an expert witness, short-term consulting jobs, or long-term outside research grants[12]. The industrial partner cannot always afford to pay their part-time faculty interns a competitive salary. There is a necessity for faculty member to understand that the internship is as much of a learning experience for them as it is a method of making additional income.

The drawbacks to faculty internships are significant. It is definitely not the preferred method for all faculty members to gain practical experience, but it is a feasible manner for others. Universities that are forward thinking about what they want their students to leave the engineering program with are ideal for producing faculty interns. Faculty members who are really committed to life-long learning are ideal for becoming faculty interns.

MUNICIPALITIES UTILIZING FACULTY INTERNS

One organization that can utilize faculty interns is a local municipality. Many municipal governments have tight budgets and cannot afford to hire more full-time engineering staff. Some municipal governments may not have the need for additional full-time staff based on their workload, but could benefit financially from utilizing the highly educated faculty interns. One small contribution by a faculty intern can more than justify the compensation provided by the municipality.

Benefits for the Municipality

It is common knowledge that municipal governments usually have financial problems. Taxes are consistently raised which makes the citizens unhappy. When funding becomes scarce, some services are either reduced or they could be dropped all together. Adding full-time engineering staff is not a cost-effective solution for financially weak municipalities, even though they usually need assistance with their engineering problems.

Other municipalities, which may not have as much financial pressure, may not need more full-time staff, but could benefit from highly educated engineers working on some of their more significant problems. Strategic planning as well as some state-of-the-art technologies could be a cost effective use of their funding.

Most municipalities are more flexible with their schedules than other types of industry. Municipalities are not usually producing a product on a strict timeline. That allows municipalities to take advantage of some opportunities that other types of industry may not be able to utilize.

Current Faculty Internship Example

One example of how a municipal government utilizes a faculty internship is the City of Kingsport, Tennessee. They employ a faculty intern from East Tennessee State

University who works part-time throughout the academic year and full-time over the summer break.

The intern gains much needed practical engineering experience in design of sanitary sewer facilities as well as project management skills that can be transferred in the classroom. The intern provides state-of-the-art knowledge on paving and erosion and sediment control, both of which are significant issues the City of Kingsport faces on a day-to-day basis. The National Pollution Discharge Elimination (NPDES) Phase II legislation from the Environmental Protection Agency (EPA) has made erosion and sediment control a significant issue for many municipalities with populations less than 100,000 residents. Pavement management is a relatively new field that stands to save all municipalities a significant amount of funding since road infrastructure is generally the largest assets that a city owns and maintains[13].

The salary the faculty intern receives is significantly less than the market rate for a graduate civil engineer, with no fringe benefits. The faculty intern desired this position purely for the practical experience, so it was a win-win situation. The faculty intern desires professional registration, which is more significant than current compensation levels[1].

The students of the faculty intern benefit from the practical experience gained. Examples from the internship make for good discussion during class, which keep the class interested and motivated. The faculty intern has gained additional confidence stemming from the new skills obtained while performing the internship.

The citizens of the City of Kingsport benefit from better management of their tax dollars. City services improve while the costs stay constant. The savings in the long-term are difficult to measure, however, even very small improvements in the state of the infrastructure can add up to significant savings over time.

CONCLUSION

Theoretical knowledge is important for educators to possess, however, there is no substitute for practical experience. The university, the students, and the faculty benefit from recent, relevant, and practical experience. Industry can also benefit from the use of faculty either through a consulting role or as faculty interns; however, their use can be somewhat limited based on time constraints. Local municipal governments can benefit drastically from even the limited part-time role of a faculty intern. Even budget constraints can be overcome if the faculty is willing to accept less monetary compensation, realizing the largest compensation is the experience gained and how that relates to teaching students. Even the citizens of the municipality served benefit from this type of arrangement. It is favorable situation for everyone involved.

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