Industry/Education Symbiosis – A Mutually Beneficial Relationship

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Introduction

Engineering and engineering technology institutions of higher learning and industrial entities have been partners for a long time. The reason is simple. Engineering and engineering technology institutions want to place most of their graduates with good jobs in industrial companies, and these same companies want to hire graduates that have a good technical education and have learned how to amply their technical knowledge and be able to "hit the ground running," as we like to say especially in engineering technology. This session includes presentations that give examples of how programs from around the country have done just that.

Consorting with Industry and Higher Education

Over 2,000 commercial and industrial projects representing over a billion square feet of construction in the United States in federal, state, private and in other countries are in the process of incorporating building information modeling (BIM). The cost to build with BIM can be 25% more depending on the involvement in design and construction variables, including the training. Since owners see a huge benefit, they are increasingly using BIM. Therefore, university programs must update their students in this technology. Here is examined the factors that influence an owner's decision in using this technology. This includes enhancing the project's coordination, addressing conflicts that reduce change orders, improving communications, and establishing a cost budget that can be better administered. Here is also discussed the relationship between the BIM industry and university construction programs, especially Penn State Harrisburg. This relationship results the students becoming more aware of BIM, its transformation and the opportunities for them. This partnering has resulted in an excellent relationship with industry and the construction program in educating its students to rapidly changing technology [1].

Effect of an Augmented Reality Tool in Early Student Motivation and Engagement

This study investigates the effectiveness of a facilitated educational program in a primary classroom for promoting technological literacy and STEM education through an augmented reality (AR) tool. A class of 22 children (control group = 10 female and 12 male) from diverse backgrounds (Caucasian, Hispanic, Asian) mean age = 5.3 years were observed in a content comprehension activity. The observers instructed the children what key concepts to look for during the exercise. One of the classes experienced a conventional teaching method by their class teacher, the second class experienced the integration of the AR tool in their learning, and the

third class experienced both methods. This way the researchers achieved two groups for study and attempted to achieve a homogenous participation with limited interruptions of the outcomes. The outcomes of the control group were compared to the non-participating children scores, who completed the exercise in a conventional way, that is reading from the illustrated examples. The results show that the observers needed to ask more clarifying questions to the children that completed the exercise conventional way. Based on the obtained results from the study, unique distinctions between the two groups and the method of teaching and learning were established. First, there was a significant improvement in student retention of the material (mean 2 = 11.875 > mean 1 = 16.611, p=0.001 with 95% confidence interval). The researchers believe that the introduction of an AR tool in early ages may spark an engaged learning and technological literacy in their later educational careers. The effects of the AR tool did not vary by ethnicity or gender [2].

Academic and Industry Collaboration – A Systemic Literature Review

As part of a greater project determining best practices for establishing and maintaining effective collaborative relationships of academic and industry professionals, this review outlines the materials available and the multiple gaps that exist in course content, methods of teaching, and practical experience that is part of a student's preparation for careers in engineering and engineering technology. Currently, there is no clear agreement on principles and practices that would best enable industrial partners and academic institutions to establish and maintain partnerships that are mutually beneficial. In fact, there is no clear definition in the literature of what such a mutually beneficial partnership would capture across the full range of educational, research, and professional development and service activities carried out within the engineering and technical community. The authors here, after a review of existing literature for a grant proposal, were confounded by the limited information on how best to establish, maintain, and obtain the full benefit from partnerships between industry and academia. Anecdotally, they also found that educators in both engineering and engineering technology are often challenged by this lack of research with sound recommendations on collaborative efforts. This is intended to be the start of a larger systemic literature review and body of work [3].

Engaging Students with Industry through a Student SME Chapter

Student chapters of professional societies have long been a valued part of the undergraduate engineering experience. A student chapter of SME can provide benefits to the involved students and faculty, as well as to local industry and the sponsoring SME chapter. Students engaged in SME gain linkage to like-minded students, valuable industry contacts, and introduction to a variety of manufacturing industry experiences. Multiple benefits can be derived through engaging students and faculty outside the classroom with industry, and when properly leveraged, provides opportunities to enhance student recruitment and retention. Local industry can gain contacts with motivated students who are strong candidates for coop terms, internships and full-time employment. While these benefits can all be achieved, there are challenges to maintaining strong student professional societies over time. Industry and students are naturally somewhat insulated from one another, and a well-directed effort is required to connect these two distinct groups. Here is outlined the benefits and presents the keys to a vibrant student chapter, the

challenges and pitfalls that might be encountered, and the resources required. Also addressed are techniques to developing a successful student chapter of SME including a motivated core of student leaders, multiple engaged faculty sponsors/advisors, strong affiliation with a local SME chapter, reasonable student membership fees, and compelling benefits of membership in the student SME chapter [4].

Tying Up the Loose Ends: Understanding Calculus

During the past three decades, the author has written about a score of papers treating aspects of mathematics that appear out of line with the mainstream mathematics community These papers were not written with an eye to textbook financial returns or to acquire promotion or tenure. The loose ends in the title refer to his collection of papers that he believes will help students who do not want to be mathematicians but will need to acquire insight into calculus-level math for use in their science, technology, and financial careers. The papers were intended to present a view of mathematics as seen and used by an engineer. Mathematics as presented in math textbooks is commonly obscured in algebraic code or defined and organized to make performing proofs of theorems easy. He is sure that the presentations will be improved over time, but it appeared to him that an attempt had to be made to break the hold that mathematicians had on the presentation of mathematical ideas. The author wants to emphasize that mathematical concepts that have been in common use stand on solid ground, but the presentation must be changed. Mathematicians are not unaware of how badly mathematics is presented to students. There has been a continuing series of reforms since Sputnik promoting math pedagogy as a "pump and not a filter." These reforms have been ineffectual and altered little. The overpowering result of this disastrous mathematics presentation is that students, who do not see the big picture, feel pressured to memorize, cheat or fake in order to slide by. Is this the result that our society and our industry want [5]?

References

[1] Cecere, J.J., "Consorting with Industry and Higher Education," *Proceedings 2020 ASEE Conference for Industry and Education Collaboration*, pp. 455201-204, Orlando, Florida, January 2020.

[2] Dakeev, U., "Effect of an Augmented Reality Tool in Early Student Motivation and Engagement," *Proceedings 2020 ASEE Conference for Industry and Education Collaboration*, pp. 455301-310, Orlando, Florida, January 2020.

[3] Lucietto, A.M., and Peters, D.L. "Academic and Industry Collaboration – A Systemic Literature Review," *Proceedings 2020 ASEE Conference for Industry and Education Collaboration*, pp. 455401-408, Orlando, Florida, January 2020.

[4] Obermeyer, J., and Untener, J., "Engaging Students with Industry through a Student SME Chapter," *Proceedings 2020 ASEE Conference for Industry and Education Collaboration*, pp. 455501-5, Orlando, Florida, January 2020.

[5] Grossfield, A., "Tying Up the Loose Ends: Understanding Calculus," *Proceedings 2020 ASEE Conference for Industry and Education Collaboration*, pp. 455601-613, Orlando, Florida, January 2020.