Engineering Education versus Vocational Training at a Tribal College: Implications for Students, School and Community

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Timothy Legg, is an 2004 alumni of Iowa State University's Computer Engineering program. He worked and consulted in the Chicago area in topics as diverse as industrial coatings, semiconductor fabrication and lean manufacturing. As of 2011, he was additionally enlisted at Cankdeska Cikana Community College for the NSF's PEEC program to teach Pre-Engineering and Mathematics courses. In 2015, he has enrolled as a graduate student at North Dakota State University

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Abstract

This paper will discuss some of the challenges that may come about from a tribal college offering both vocational training and professional engineering programs. The paper will describe synergistic opportunities as well as other situations that could arise as a result of external support, historic political situation and competitions for students, resources and time in the communities making up the service area for most tribal colleges. Potential impacts on the surrounding community both immediate and long-term will be discussed with consideration of implications for economic and infrastructure development. Desirable characteristics of the resources needed to support each program will also be described with special emphasis on faculty, their availability and continual professional development. Context of these considerations to regional and national situations will also be discussed with emphasis on opportunities for mainstream institutions. Comparison to situations faced by mainstream institutions will be considered and potential ramifications will also be discussed.

Background

Historically, the administration of Pres. Jackson strove to provide enough training for Native Americans to become service workers, i.e. cobblers, maids, etc., within the American economy, which at the time seemed a viable political alternative to elimination of the race. Today this training could likely be accomplished by attending a two-year community college program resulting in an Associate of Science degree or certificate in an applied-technological field, i.e plumbing, carpentry, electronics, service technician, etc. A similar situation occurred at the end of the Civil War, shortly after the land-grant legislation was enacted, when the historically black college system was established. The intentional choices made by Tuskegee and Howard colleges to offer classical humanities educational programs versus applied programs was done with the intent of providing a higher-intellectual set of opportunities for their graduates, in effect allowing them to become doctors and lawyers and teachers as opposed to applied technologists (Carney). The comparable choice for tribally controlled colleges, currently being decided either intentionally or not, is the focus of this paper.

The tribal college movement, largely born in the late 1960's and early 1970's, served two immediate demands on their respective reservations and Native communities: Methods for exchanging cultural knowledge and opportunities for vocational training. The graduates of these institutions provide qualified skills to local businesses, governmental offices and other tribal enterprises. (Cajete). Following this first phase, many of these colleges have evolved into research institutions and universities providing a sustainable intellectual capital within their region. The other side of the economic cycle is the investment in the tribal colleges to enable them to be self-sufficient and continuously improving institutions.

Context of scenario

The Pre-Engineering Education Collaborative, PEEC, is a rather unique program funded by the National Science Foundation, NSF, in the summer of 2010 as a way to get tribal colleges and universities, TCU's, to work with mainstream institutions to develop an engineering pipeline through TCU's to culminate at graduation from four-year mainstream institutions. As enacted, the program had funding from two NSF directorates, Engineering and Human Development and as a result had two primary goals. One of the goals was the development of engineering capable curriculum and students at TCU's. The second goal was to look at educational approaches to bring minority students into the engineering profession. With the onset of the PEEC program, funding was provided to the tribal colleges in the state to allow for employment of faculty with qualifications and practical experience to prepare 100 and 200 level courses for students destined to transfer to North Dakota State University, NDSU, or other similar 4-year institutions in the region. There are four participating tribal colleges within this program that created two-year Associates Degrees of Pre-Engineering with the expectation that the students continue onward to complete at NDSU, with the teamwork of their peers gained during the tribal college component of their studies. These peers continue as a support network for the students onwards towards the completion of their degrees at NDSU.

Impacts for Tribal Institutions

Aside from short term economic boost from the hiring of the qualified faculty and upgrading of facilities to the region, the long term impacts are in the development of a home-grown engineering society. As Native Americans feel a spiritual connection to their respective homelands (Deloria), the intellectual investment is culturally rewarded by tending to stay close to the home and propagate the skills onwards into future generations through mentorship, educating or parenting.

Due to the closed nature of many Native communities (Deloria, Sonneborn, et al), a strong tribal college system is essential for economic, intellectual and cultural sustainability. Some institutions do prefer to employ people from within their own community so that rapport with the students can be more quickly achieved and cultural knowledge will be shared and passed on. Having locally produced professionals serve as compelling role models for youth entering higher education.

A base of professionally trained population can also bring revenues onto the reservation. As graduates are employed and the nature of their work often requires work in larger populations or metropolitan areas, the close family ties and connectedness to community will cause an inflow of wealth into Native communities that would otherwise not occur. If a large enough of an educated population exists it is inevitable that industries requiring skilled labor will begin to appear (Cherokee Nation Industries is now the largest employer in OK, educated via Northeastern State University)

Resources Tribal Colleges Need for Self-sustaining Growth

Qualified and motivated faculty, whom are willing to immerse themselves in the culture of the society they serve, are very welcome in a tribal college setting. In addition to the standard expectations of professional developmental exercises, faculty are encouraged to participate in courses that study the local culture, artwork or even language. Incorporation of these cultural components are used in class and are known to aid in student retention.

Talented and strong leadership is equally valuable at the tribal college where accountability of the student and faculty are measured and shared according to the current state of the art. In small communities, there are outside political pressures that try to unjustly influence academic decisions and firm leadership is required for not yielding under these external demands. A well connected leadership is also necessary for tracking alumni for fundraising, tracking employment statistics and progress of students that have transferred from their institutions and uses the data to observe trends that can be corrected.

Many of these faculty, like those brought in by programs such as PEEC, end up collaborating with existing vocational staff to exchange ideas and strategies in methods for improving their courses and environments for their students. A pre-engineering instructor hired to teach mechanics can now collaborate with a wood shop instructor to develop a curriculum that includes rapid prototyping methods using automated wood carving tools. What results is a CAD course where 3-D wooden models are created as a semester project.

At one of the institutions, Cankdeska Cikana, an instructor skilled in electrical and computer engineering, assisted in HVAC courses to share his practical experience in electrical installation and also explain the physics of electricity to the students. At Fort Berthold Community College, an instructor with a degree and experience in Industrial Engineering created an internship program aimed at undergraduate professional development. Collaborations such as these are still rare, but are becoming more and more common as these institutions mature and grow into sustainable models.

In addition to the brain gain into Native communities, these grants also bring in improvements to the pedagogical infrastructure that have benefits that continue to be provided long after the grant is complete. As each of these tribal communities (as many others in the US) are located in rural areas, the usage of technology is essential for sharing faculty and students to create courses-over-internet with sustainable class sizes. Practically every institution upgraded with video-conferencing installations, and their respective institutions for the first time in their histories, collaborated in scheduling courses taught simultaneously at remote sites. In our institutions, it is required for the faculty to visit their remote sites to bond with their students and be available to answer questions in person, as opposed to Apple Facetime or Microsoft's Skype or NetMeeting.

Outcomes for Regional and National Populations

Programs such as PEEC serve underrepresented populations, such as Native Americans or Pacific Islanders, in their quests for higher education in STEM fields. The ABET accredited institutions universally welcome the diversity, worldviews and alternative thoughts that these students bring with them to their classes and social organizations. The democratization of these skills enables the United States to be more competitive in a global paradigm and allows for informed and critically thought-out solutions to local and national problems, eliminating the need for importing or relocating future engineers or resources.

The 21st century student expects and needs access to global populations in order to comprehend their position in a global market. These include local Indigenous populations as well as those from international sources. Universities are internationally sourced collaborative communities whose populations bring their own histories, technologies practices and science.

Challenges faced by tribal colleges

Many of the challenges faced by mainstream institutions are shared with tribal institutions. Complying with expectations of accreditors for their colleges, competing for state and federal grants and seeking funds from alumni and other private entities are a few of the obvious. Maintaining a sustained skilled faculty requires a long horizon view from the leadership to allow a workplace that welcomes, invites and retains faculty (Robert I Sutton). Founding new programs that expand the curriculum or serve community needs. Constructing and maintaining new facilities to house classrooms, research labs, and faculty offices is also a shared struggle.

There are a number of grants that are exclusive to tribal colleges and larger land grant institutions, due in part to their size, but also political hierarchies. Tribal colleges, being located on reservations, are typically not under state, but federal jurisdiction. As state laws do not apply within their borders, a large portion of state funds are unavailable. Just as state governments need to be reminded of the importance of their universities, tribal colleges increasingly need to do the same to compete for funds from tribally run enterprises, such as casinos. Some colleges, such as Cankdeska Cikana, have actually had occasions where tribal governments failed to contribute any funding for years on end and have been forced to sustain from Pell revenue and federal grants. The financial windfall of the oil boom in western Rectangular State has also led some community leaders to question the very need of educational institutions in the face of new comfort from a likely temporary effervescent wealth.

Just like all educational institutions, tribal colleges tailor themselves to be oriented towards satisfying the student's goals. Should this be for starting a Construction Engineering degree with the help of a trained engineer, learning the Lakota language from a first-language speaker, or entrepreneurial sciences from a business owner, local tribal colleges serve the students desire for continual improvement.

There are a number of strong points in the favor of tribal colleges over their mainstream counterparts. Their compact size with a "everybody knows each other" atmosphere allows the

institution to be highly adaptive and dynamic in meeting student needs in terms of creating courses for students wishing to specialize in certain areas. Smaller class sizes allow for more personal and tailored instruction with the students. Tribal colleges tend to be populated with the more determined 'non-traditional' students whom enter college with practical experiences and mature attitudes towards success.

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