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Developing a Distance Learning Program in Industrial Technology

The need for a distance learning program in Industrial Technology in California comes from a quirk in the state's higher education system. This paper will look at this need, what it takes to set up such a program, including the transfer issues and discuss of the level of student sacrifices necessary for their bachelor's degree.

Since the development of the Master Plan in the 1960's, state supported higher education has been within the reach of most Californians. The first step for many students is to attend the closest of the 109 community colleges. The next step for many is to transfer to one of thirty nearby California State University (CSU) campuses for a bachelor's degree. The system works well for those pursuing liberal arts degrees or professional degrees where both schools have similar programs. But there are problems for those students who have been taking technology related classes at the community college. While a few courses in drafting or electronics might transfer into an engineering program, they would still lose a lot of credits if they got into a strict engineering program. It comes down to the fact that students who earn an associate's degree in traditional vocational areas have trouble finding a place to continue to the next step.

Many California State University campuses don't have an Engineering or Industrial Technology program that will accept transfer of the technology course credits from the community college. Those students with an associate of science degree in a technology field who live near a university without a Technology program can lose up to a year's worth of credit when they pursue a bachelor's degree at that local school. Further, these students would be getting a degree in discipline that isn't their first choice. What options do these students have?

Moving across the state to a CSU campus to get a bachelor's degree in a Technology program is not a realistic option for most of these students. At this point, many of these students are married with jobs and children. Moving to get an advanced degree, a masters or doctorate, is a sacrifice many faculty members understand. But for a student whose motivation for a bachelor's degree is better pay and promotion, it is understandable that such a move is more sacrifice than they are willing to make. Some of the CSU schools with Technology programs are in areas with high costs of living, which makes it even more difficult for making such a move.

It would be possible for these students to commute several hours each way to attend a school with a Technology program. But once again, this type of sacrifice is would be difficult, if not impossible to make while supporting a family. The cost, not to mention the time, of commuting is again, more sacrifice than these students can handle.

One other option to earn a bachelor's degree is to attend a private college. Once again, the cost of these schools constitute a serious financial sacrifice and some students find that some of these schools are not as well equipped in Technology areas (except computer labs) as state schools. These programs are promoted through television advertisements, and their continued promotion is an indication that some students choose this option and it remains a viable

market. It is interesting to note that some of these schools provide their instruction via distance learning formats.

The best option for these students is to earn their bachelor's degree from a program that offers a distance learning format. The Industrial Technology program at CSU, Fresno has been working on this effort and whether it can offer a full program will depend on how well in can clear the hurdles outlined below. Two major threads of concern that need to be addressed are recruitment and the ability to provide a quality program on-line.

Recruitment must go beyond printing a few brochures or posting a few notices on-line or in campus newspapers. Alliances must be developed with community college programs and the university departments. One good way to develop alliances is alignment with some of the popular community college programs, such as Cisco Academy. This program and others like it, require students to complete a depth of study in a technical area that can be transferred to the university. These programs also make recruitment easier as the university program can be presented as the logical extension of these programs.

It must be remembered that these students will be using the internet for course delivery. They are comfortable using the web. Like it or not, they will also be using the internet for advisement and to generally evaluate the university program. These students want to know that they can find information on-line when they need it. The department website has to provide easy links to university catalogs and other services.

Finally, a key to the recruitment process is the alliance with the guidance counselors at the distance community colleges. How to make this connection is a study in itself, but it will involve some sort of personal interaction with department faculty. This link can't be done through email or telephone. Faculty must visit these remote campuses, which can be tied to instruction, as will be seen later.

After recruitment, the second major concern is having a quality curriculum. A department could create a degree plan just for the distance learning student and the university curriculum approval process would assure that such a new plan would be academically sound. However, this is a complicated process that has to be completed before students enter the program. Working within an existing curriculum is a better way to start.

At CSUF, the existing degree plan fits well for a distance learning program. (See Figure A.) As with most Industrial Technology programs, the goal of this program is to train technical managers through hands-on education. In addition to the general education program required of all students, Industrial Technology get a breath of exposure to technology, focused technology management courses and a depth of study in a specific technology.

The depth of study can be completed at the community college. In today's educational environment in California, this is an advantage for the students financially and educationally. Tuition at the community college is much cheaper than at a CSU campus. The community colleges have more up-to-date equipment than the four-year schools, so these students can develop a better understanding of the technical aspects of such areas as photonics (lasers), computer aided manufacturing and electronics. There are some caveats in using transfer

credit for the elective depth of study segment of the degree. The number of transfer units is limited so they have to be careful not to try to transfer too many, which could also impact the residency requirements.

Providing the technology management core in a distance learning format is a matter of developing on-line delivery for the courses. Here, the university rules and resources come into play. At CSUF, a web-based course is a fully on-line course while a web-assisted course still meets face to face. These technology management courses are lecture courses which can be delivered on line (web-based) using the current modes of presentation, such as Blackboard. At CSUF, the university provides assistance in converting traditional lecture courses into web-based courses. Of course there are university faculty reviews and approvals needed to make sure the courses are adapted properly. This is a point at which critics of on-line education raise concerns about the quality of the courses. Their concern is that program quality is not sacrificed for expedience.

The most difficult section to deliver on line is the technical core. This section includes courses in electrical/electronics, mechanics, design/drafting along with the science (physics and chemistry) and mathematics. Many of these courses are lower division which means they can be transferred from the community college. Although much of the hands-on work is done at the community college, there are still some technical coursework that need to be done at the upper division level and in person.

One obvious way to provide in person instruction is to take the instructor to the student. In situations where there is an adequate concentration of students, this is ideal, if adequate facilities can be found at the local community college. A side benefit of having an instructor teach at the remote campuses is that recruitment and advising can be done for the remote students as well as a relationship can be developed with the guidance counselor.

While most community colleges have adequate computer labs and some even have production labs, they rarely have material labs. This means that in the case of the CSUF program, some courses need to be taught in person and on the CSUF campus. The course that displays the most creative use of university rules and on-line delivery covers industrial materials. The community colleges don't generally have one lab with the necessary equipment available for tensile and impact testing or micro-structural analysis of metals which this class needs whereas the CSUF campus has. It would weaken the program to drop this from the core, so university rules and student sacrifices can keep this course from becoming a bottleneck in the program.

 While a web-based course is conducted 100% on-line, instruction in a web-assisted course can be 50% on-line. The materials course in question is a lab/lecture classification that is two-hour lecture and two-hour lab each week. By doing the lectures on-line, only the lab work needs to be done in person. When this course is offered in a weekend format, the lab work can be done in two and a half weekends. Traveling two weekends to the home campus for a course is not too great a sacrifice for students to make for bachelor's degree. Two weekends because the other half weekend is conducted at a commercial testing house close to their home. Most of the distance learning students currently enrolled live in San Diego or Los Angeles. The department has established a relationship with SSMT laboratories in the Los

Angeles area where the southern California students get a real life exposure to the testing applications.

In other words, this class combines all the features of how a distance learning class can be organized. Lecture material is covered on-line through virtual methods and accounts for half of the course. In person, it meets for two long weekends in Fresno for lab work. For one half of a weekend, distance students meet in their area and the instructor travels with them to a commercial laboratory. If the student evaluations are to be believed, this is one of their favorite classes. There are side benefits from having these students visit the campus that will grant their degree. They get to see the entire faculty and all their alma mater has to offer.

One other element of a degree for these students is meeting their general education requirements. (See Figure B) The state has developed a system for transfer of the lower division general education, which is universal to almost every degree plan. A website has been developed, ASSIST.ORG that facilitates this statewide articulation. Besides using this to coordinate the lower division general education courses, the department taps into this system by including the technology courses in the technical core are qualified for articulation.

Another aspect of the general education requirement are the upper division courses. These have to be completed through the degree granting campus. At first, this was a roadblock, but as the availability of web-based courses has grown, there are currently enough courses offered in each section that the distance students can meet this requirement.

One final aspect that deserves mention and would be source for future study is the make-up of the students. Anecdotally, the distance learning students appear to be more motivated to earn their degree than the traditional student who go to the university straight from high school. These students seem to do well in web-based courses. It would be worth studying this closer to find out if this is because they are a little older and more mature or must more motivated.

In summary, for programs considering creating a distance learning program, they need to consider several aspects, including determining if there is a need for a distance program. Recruiting and advising distance students must be integral to the program. Setting up curriculum in the program requires the effective use of university rules for transfer of credits and face time with students, along with creative scheduling. This can keep the sacrifices that the students and faculty have to make to a minimum.

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Figure A – Industrial Technology Major Requirements at CSUF

		UNITS
Technical Core (25)		
IT 52	Electricity and Electronics	3
IT 74	Manufacturing Processes	3
IT 102	Ind Computer Concepts+Apps	3
IT 104	Product Design	3
IT 114	Industrial Materials	3
IT 115	CAD Principles and Methods	3
DS 73	Statistics	3
Chem 3A	Intro to General Chemistry	4
Management Core (22)		
IT 92	Industrial Safety Management	3
IT 107	Facility Planning	3
IT 117	Quality Assurance	3
IT 118	Production Operations	3
IT 148	Proj Mgt and Control	3
IT 137	International Quality Standards	3
IT 196	Senior Seminar	1
IT 199	Senior Problems	3
	MAJOR TOTAL	**(47)**

Specialty Area Electives

Consult department advisors to develop

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ELECTIVES TOTAL   **(21)**

Figure B – General Education Requirements at CSUF

Area A
A1   Oral Communication
A2   Written Communication
A3   Critical Thinking:

Area B
12 semester units minimum including 3 upper division.
One course is required in each subarea.
B1   Physical Science: **Phys 2A required**
B2   Life Science
B4   Quantitative Reasoning

Area C
12 semester units minimum including 3 units upper division.

Select one course from C1, C2, and IC plus one additional

course from either C1 or C2.
C1   Arts
C2   Humanities
C1/C2 One Additional Course from C1 or C2

Area D
15 semester units minimum including 6 units upper
division. One course is required in each sub-area.
D1   American History

D2   American Government

D3   Social Science: **IT 20 required**

Area E

3 semester units minimum

E1   Lifelong Understanding and Self-Development

UPPER DIVISION G.E.
IB   Integration, Area B
IC   Integration, Area C
ID   Integration, Area D
MI   Multicultural/International, Area D