The Perils of Cooperative Engineering Programs

Douglas R. Carroll
Missouri University of Science and Technology

Abstract

Cooperative Engineering programs are designed to allow a public university system to better serve the people of the state. Many prospective students are "place-bound" in the sense that they cannot move and attend the main campus that offers an engineering program, either because they have a good job, or family commitments, or because they cannot afford the housing costs associated with moving. In a Cooperative Engineering program, the "Main Campus" forms a cooperative agreement with the "Host Campus" which allows students to take engineering courses at the Host Campus, and complete their degree without moving to the Main Campus. The academics of the Cooperative Engineering Programs are straightforward. The degree earned is from the Main Campus, and the Main Campus organizes and is responsible for teaching the engineering courses that are offered on the Host Campus site. The non-engineering courses are offered by the Host Campus. From an academic viewpoint it is similar to a transfer program, except that the students do not physically transfer to the Main Campus.

Many of the problems that arise in the Cooperative Engineering programs are administrative in nature. The administrative activities of admissions, registration, tuition, fees, billing and financial aid are all computerized and automated. Because students enroll in classes from both campuses; they often will not meet the definition of full time status at either campus. The systems are automated and will automatically change admission status to part-time, deny financial aid, calculate the wrong tuition and fees and bill students for the wrong amount. The math and science courses taken at the Host Campus serve as prerequisites for engineering courses offered by the Main Campus, but the Main Campus system will not know that the students have completed the prerequisites. The system will drop students from their classes or not allow enrollment in classes because the students do not appear to meet the prerequisites. Processes and procedures must be developed to work around the automated responses of the system.

There are also political issues associated with Cooperative Engineering programs. The Main Campus may view the program as competition and be concerned that they are losing enrollment to the Cooperative Engineering program. Departments at the Host Campus may feel that they are losing resources and students to the Cooperative Engineering program. These political issues must be addressed if the program is to be successful.

Introduction

A Cooperative Engineering Program allows students to earn an engineering degree while attending college at a campus that does not offer engineering as a major. The program is a cooperative effort between the "Main Campus" that offers the engineering degree and the "Host Campus" where the students attend classes. The engineering classes required for the major are offered and transcripted by the Main Campus, but are taught on the Host Campus either as traditional classes or as distance education. The non-engineering classes (math, science, history, English, economics, etc.) are offered by the Host Campus. Engineering programs are composed of approximately 50% engineering courses and 50% non-engineering courses, so each campus teaches approximately 50% of the courses in the degree plan. The engineering degrees earned by the students and the diplomas granted upon graduation are from the Main Campus.

Teaching the laboratory classes is a challenge in the Cooperative Engineering programs. The Host campus will not have the resources to be able to duplicate all of the lab facilities available on the Main Campus. However, most of the undergraduate labs are relatively inexpensive and can be duplicated on the Host Campus. In the programs that the author is most familiar with, $500k was adequate funds to purchase the equipment necessary to teach the majority of laboratory classes for an engineering major. Students travel to the Main Campus to take the laboratory classes that cannot be duplicated. Classes can be taught on Saturdays and coordinated to minimize the number of trips the students must make to the Main Campus.

Cooperative Engineering Programs provide a way for engineering schools to better serve the people of the state. Many students are place-bound in the sense that they can only afford to pay for college by getting the free room and board that comes with living with their parents. Saving the costs of room and board greatly reduces the costs that students and their families must pay for their college education. Some students, especially non-traditional students, have jobs and/or family commitments that prevent them from attending the Main Campus. A Cooperative Engineering Program located in a metropolitan area that has no engineering college provides an opportunity for students who would otherwise not be able to earn an engineering degree.

A Cooperative Engineering Program reduces the costs to the students and their families, but it will increase the overall costs that the state must pay for engineering education. Having the students attend the Main Campus for their engineering education is more cost effective for the state than setting up a Cooperative Engineering Program. Students and their families may save on the room and board costs of attending college, but in principle they pay more in taxes to support the Cooperative Engineering Programs. The Cooperative Engineering Program reduces the number of students that need to be educated on the Main Campus, which in principle reduces the educational costs on the Main Campus. It is difficult to say which approach places the least burden overall on the individual citizens of the state.

Costs of Establishing a Cooperative Engineering Program

The single largest cost of setting up a Cooperative Engineering Program is the building space required. Unfortunately, this cost is often not considered when deciding whether or not to establish the program. The Host Campus provides the building space, and because they want to be able to offer the engineering program, the Host Campus usually offers to provide the building space at no cost. With honest accounting, a very small engineering program will occupy $10M worth of building space, and a moderate sized engineering program two or three times that amount of building space. The program will require office space, laboratory space and classroom space. These are large costs, and are born by the Host Campus.

Faculty and staff need to be hired to run the program. The Main Campus may be able to provide some classes through distance education, which can reduce the number of faculty that must be hired at the Host Campus. Adjunct faculty can be hired to teach some engineering classes. With help from distance education and adjunct faculty, a BS degree in engineering can be offered by a faculty director, two faculty members and an administrative assistant. Salary and benefits are about $400K per year for a single engineering degree. There are administrative savings on offering multiple degrees. Additional degrees can be added for about $300k per year in salary and benefits. The Cooperative Engineering Programs in existence typically offer two or three engineering degrees[1], so the personnel costs are typically $700K to $1.0M annually.

We often talk about the cost of engineering laboratories, but at engineering universities, most of the laboratory expense is associated with research laboratories, not undergraduate laboratories. With careful planning, the equipment for the undergraduate labs can be purchased for about $500K for each engineering degree offered. Building space for the laboratories is more expensive than the equipment.

Political Issues

The Main Campus may view the Cooperative Engineering Program as a competitor for students and state resources. The Main Campus may be concerned that they are losing students and state funding to the Host Campus through the Cooperative Engineering Program. Students earn their degree from the Main Campus, but attend the Host Campus. The Main Campus may be concerned that the students will be more loyal to the Host Campus than to the Main Campus that granted their degree. Graduates of the Cooperative Engineering Program may be more likely to donate to the Host Campus than the Main Campus. These political issues need to be addressed, or some faculty and staff at the Main Campus may be reluctant to support the Cooperative Engineering Program.

The administration at the Host Campus is pleased to be able to offer the engineering program on the campus. Having an engineering program offered on campus increases the prestige of the campus and provides new opportunities to students. However, individual

departments on campus may be asked to give up building space to support the engineering program. Giving up building space is a difficult and politically charged process at any campus. The mathematics and science departments may feel that they are losing students to the engineering program, and worry that their enrollment will decline. Departments with declining student enrollments are often the target of budget cuts. Departments may also feel that they are giving up faculty positions to provide the faculty required by the engineering program. The Cooperative Engineering Program may be good for the Host Campus as a whole and provide new opportunities for students, but it may hurt some individual departments on campus. Departments need to feel that they will not be adversely affected, or they will be reluctant to support the Cooperative Engineering Program.

The Cooperative Engineering Program is a part of two campuses, and faces political issues on both campuses. Up-front planning can help alleviate the political issues. The Main Campus needs to feel that they will not lose a significant number of students to the Cooperative Engineering Program. Enrollment Restrictions may need to be put in place to ensure that this loss does not happen. The Main Campus needs to feel that they have a presence at the Host Campus, and that the students in the program understand that they are earning their degree from the Main Campus. Building space and funding for faculty positions and laboratories should be in place prior to starting the Cooperative Engineering Program at the Host Campus. The departments on the Host Campus need assurance that they will not be adversely affected by the Cooperative Engineering Program.

Program Administration

University administrative processes are automated and computerized, and many of the administrative problems encountered by Cooperative Engineering Programs are rooted in the fact that the two universities may use two different and incompatible systems. Admissions, registration, tuition, billing, financial aid and records are all tied together in one system, and in order for the system to work, the program must comply with the established processes. Processes and procedures must be developed for the Cooperative Engineering Program so that the students in the program can be admitted, registered, have proper records at both universities, and pay their bills. Each university will have its own system and processes, and the Cooperative Engineering Program office will need to develop processes that meets the needs of both systems.

Admissions

Students must be admitted to a university before they can register for classes or seek a degree. Since students will enroll in the engineering classes through the Main Campus and the non-engineering classes through the Host Campus, they must be admitted to both campuses. A good way to handle this is to have the students apply to both universities independently, filling

out two applications and getting transcripts sent to both universities. The admissions process is automated, and having students fill out two applications is much easier than fighting the system.

A code must be set up in the admissions process to identify the students as being in the Cooperative Engineering Program. There are many ways the code can be set up, and each university will probably do it differently, but each university will need to be able to identify which students are in the Cooperative Engineering Program in order to do billing and financial aid. Some students will start in the Cooperative Engineering Program and then change to a different major at the Host Campus. The code must be changed for those students when they change majors, or they may not receive the correct financial aid or be billed correctly.

Registration

Students register for the engineering classes through the Main Campus registration system, selecting the sections that meet on the Host Campus. One problem that may arise is that students on the Main Campus may accidentally enroll for sections that meet on the Host Campus. By the time the students have been notified that they are in the wrong section, sections that meet on the Main Campus may have filled, making it difficult or impossible for the students to register for the classes they need. It is important to work out a process so that students on the Main Campus cannot accidentally enroll for sections offered on the Host Campus.

In order to register for classes, students must have their advising hold (and other holds) cleared. In order for faculty to clear advising holds, the system must grant faculty the authority to do so. Faculty will be employed by one university or the other, but will need an appointment or courtesy appointment at both universities that is at a level high enough to allow them to clear advising holds. For some registration systems, students need to be assigned to a particular faculty advisor in order to allow the faculty advisor to release the hold. Other registration systems grant faculty the authority to release advising holds for any student at the university. Every university advising system is different, but most require that the faculty advisor release the student before they can register. A process must be worked out to allow the faculty to release students so they can register at both universities.

Students will be taking courses from both universities, and some of the courses taken from the Host Campus (such as calculus and physics) will be prerequisites for the engineering courses taken at the Main Campus. Transcripts need to be sent from the Host Campus to the Main Campus each semester so that the courses can be transferred, and so that students will not be denied registration in a course because they do not meet the prerequisites.

Tuition and Fees

Students pay Host Campus tuition rates to the Host Campus for the non-engineering courses taken from the Host Campus and Main Campus tuition rates to the Main Campus for the

engineering courses taken from the Main Campus. The fees that students pay will need to be negotiated. It doesn't make sense for students to pay health services and student activities fees at both campuses. The two universities need to decide which fees students must pay.

Financial Aid

The externally funded scholarships and aid (Pell Grants, state funded scholarships, private scholarships, etc.) are not an issue; students will receive the externally funded financial aid. Issues arise with university funded scholarships and out-of-state tuition waivers or reductions. The financial aid issues center around which university will pay the costs. The Host Campus is normally in charge of dispersing the financial aid, but agreements must be reached as to how much financial aid the students will receive.

In order to receive financial aid, most programs require that students maintain full time student status. For externally funded financial aid, students can usually add the total courses from different universities to achieve full time status and receive their financial aid. However, for university funded financial aid, a student must carry a full load of classes at the university which is providing the aid. The financial aid department at the Host University will decide if the student is full time or not, and this process is automated. Students take courses from both universities, so a process must be developed so that the system at the Host Campus will recognize the full time status of the students. One method is to develop "placeholder courses" at the Host Campus so that when students register for engineering courses at the Main Campus, they are also enrolled in placeholder courses at the Host Campus. The Cooperative Engineering Program office may need to manually enroll the students in the placeholder courses. This solves the problem of maintaining full time status during the semester.

If placeholder classes are used, the registrar at the Host Campus cannot grant any credit value to the placeholder courses because they are not real courses, so at the end of the semester the students will not complete enough credits for satisfactory progress. Transcripts will need to be sent from the Main Campus to the Host Campus at the end of each semester so that the engineering courses can be transferred to the Host Campus. If the engineering courses are not officially transferred to the Host Campus, the financial aid system will automatically cancel all financial aid that requires full time status. This can be fixed manually, but it leads to anxiety and frustration from the students and their families.

The university funded scholarships are predominantly merit based aid, and automatically awarded to students based on their ACT or SAT score and their high school rank or GPA. The two universities will almost certainly have different programs and levels of funding for the merit based aid. The level of merit based aid and which university pays for it will need to be negotiated.

Universities may award out-of-state tuition waivers for certain students (usually high academic ability students). They may also have programs that offer reduced out-of-state tuition for students from other states (usually neighboring states). The two universities will almost certainly have different policies for awarding this type of financial aid, and a negotiated agreement will need to be reached.

The financial aid agreements reached need to be communicated to the people in charge of recruiting new students to the Host Campus. The financial aid received by students in the Cooperative Engineering Program may be very different from the financial aid given to students who select other majors at the Host Campus. It is very difficult to properly inform prospective students about the financial aid they will receive if they choose to be in the Cooperative Engineering Program. Students will come to the Host Campus feeling that they were promised a financial aid package, and then find out that they will not receive the promised financial aid package if they choose to be in the Cooperative Engineering Program. It is important to make a good faith effort to communicate the financial aid information to prospective students and their parents, but it is also important to recognize that some students and parents may feel they were misinformed. Only a very small fraction of incoming freshmen will choose to be in the Cooperative Engineering Program, and the recruiting staff cannot realistically put a lot of emphasis on an exception that applies to such a small fraction of the students they are recruiting. Emphasizing the financial aid exception puts a negative spin on the recruiting effort, which may hurt in recruiting new students to the Host Campus. A process needs to be put in place to allow the financial aid office at the Host Campus and the Cooperative Engineering Program office to deal with students and parents who feel they are not receiving the financial aid they were promised.

Billing and Collection

Billing and collection is done by the Host Campus. Students are billed for the total tuition and fees for both campuses, less their financial aid. This is a straightforward process once the universities have come to an agreement of the tuition and fees the students must pay at each campus, and the financial aid they will receive. Students send their payments to the Host Campus. The Host Campus will put a registration hold on students who do not pay the bills which will not allow them to register for courses at the Host Campus. In extreme cases of non-payment, the Host Campus may need to ask the Main Campus to put a registration hold on non-paying students.

Dividing Revenue

Engineering courses may be taught by faculty from either university. Labs at the Host Campus will be provided by the Host Campus. Students may need to travel to the Main Campus for some lab experiments, when the cost of duplicating the lab at the Host Campus is too great.

The revenue (tuition and fees) will need to be split according to which university provides the teaching resources. The first step is to reach a general agreement of how the revenue will be divided. Universities have automated processes for billing and collection and keeping records. The agreement reached in dividing the resources must be compatible with the billing/collection/records systems at the universities. Universities must do the billing, collections and records in a way that will allow for an audit.

Minors and Honors Programs

Students may wish to pursue a minor in a non-engineering field, or they may wish to participate in the university honors program. The issue that arises is that the students are pursuing an engineering degree from the Main Campus and will not receive a degree from the Host Campus. The minor or honors program cannot be recognized by the Host Campus because the students will not receive a degree from the Host Campus. Students cannot earn a minor without earning a major. Departments on the Main Campus cannot award a minor because the students will not take any of the courses for the minor from the department on the Main Campus. A department cannot award a minor purely from transfer credits.

If a student earns a major on the Host Campus, then the student is also able to earn minors and be recognized as in the honors program at the Host Campus. However, this may require a lot of additional coursework and be impractical for most students. From a practical viewpoint, students in the Cooperative Engineering Program cannot earn minors or be recognized for being in the university honors program. They can take the courses and gain the knowledge, but it is not possible to officially recognize their accomplishment.

NCAA Athletics

Students in the Cooperative Engineering Program are pursuing a degree from the Main Campus. They are not eligible to participate in NCAA athletics at the Host Campus. If a student is pursuing a double major, one at each campus, the student must maintain full time status at the Host Campus each semester in order to participate in NCAA athletics. In principle, students can enroll full time at the Host Campus pursuing a major at the Host Campus, and also take one engineering course per semester from the Main Campus. Students can play out their eligibility and earn their degree from the Host Campus and then begin taking a full load of engineering classes from the Main Campus. Students would need to take two years of engineering courses after playing out their eligibility, which means it would take six or seven years to complete the engineering degree. For most students it is not practical to pursue an engineering degree in the Cooperative Engineering Program and participate in NCAA athletics at the Host Campus.

Summary and Conclusions

Having spent two years working through the perils of developing a Cooperative Engineering program, the author has the following suggestions for universities considering a similar endeavor. Every program will be different, but many of the problems listed will be common to other Cooperative Engineering programs. Planning for these problems will assist with implementation of the program.

1. If the engineering degree is granted by the Main Campus, then the Main Campus needs to feel that it is their program, and that the students are their students. The Main Campus logo should be displayed in the engineering office on the Host Campus, and should be included on the handouts and displays that are used to advertise the program. The Host Campus logo should also be displayed. It is a cooperative program, and the program and students belong to both universities.

2. The building space required (office, classrooms and labs) should be defined prior to starting the program. The engineering program should grow into the space, rather than gradually taking space from other departments on the Host Campus as the engineering program grows. Faculty positions and funding should be defined so that departments on the Host Campus do not feel they are giving up faculty positions to support the Cooperative Engineering program.

3. The administrative systems for admissions, registration, tuition and fees, financial aid and billing are all computerized and automatically linked. In most cases, the systems at the two universities will not be compatible, and not able to communicate with each other. In general, it is best to develop processes that provide the information to both university systems, and allow the systems to process the Cooperative Engineering students as they would other students on campus. Students may apply for admission to both universities and register for classes through both university registration systems. Safeguards will need to be put in place to ensure that the students are recognized as full time students so they can receive financial aid and be billed properly. Transcripts may need to be sent each semester to allow the registrar at both universities to keep track of the courses that have been completed.

4. The universities will need to decide how to divide the tuition revenue from the engineering courses. Both campuses may provide faculty, classroom, distance education or lab facilities to support the program. An agreement needs to be reached as to how the revenue will be divided.

5. Other problems include honors programs, minors and NCAA athletics. Will the Cooperative Engineering students be allowed to participate in the honors program at one campus or the other? Will they be able to earn a minor in a non-engineering subject?

Will they be able to participate in NCAA athletics at the Host Campus? In all of the questions, the issue is that the students are physically at the Host Campus, but earning a degree from the Main Campus. If the students are not earning a major at the Host Campus, then they cannot be recognized on the Host Campus transcript as an honors student or as having earned a minor and they are not eligible to participate in NCAA athletics at the Host Campus.

References

1. Egbert, R. I., Stone, L.H. and Adams, D.L. "Characteristics, Similarities, and Difference Among Four-Year Cooperative Engineering Programs in the United States", in review for ASEE Prism, Please contact the author for a copy of the paper.

Biographical Information

Dr. Douglas R. Carroll PhD PE is a Professor of Mechanical Engineering at the Missouri University of Science and Technology. He recently became the Director of the Cooperative Engineering Program, a cooperative program between Missouri S&T and Missouri State Universities.