Engineering Center Residence Hall Program

David R. Thompson, Steven D. Langstraat, and Virgil Nichols

College of Engineering, Architecture and Technology
Oklahoma State University

Introduction

Planning in the College of Engineering, Architecture and Technology at Oklahoma State University throughout the decade of the 1990's, called for increased student recruitment and retention. Engineering and Architectural programs in the College operate under the professional school concept. Students are admitted to the first two years of pre-professional study and then must be admitted to the professional school of their choice based on performance in their pre-professional work. Although most of the professional schools were at or near capacity, there was a desire to recruit and retain more students and to improve the academic performance of students in the pre-professional courses. Improving these aspects should result in more capable students in the professional programs.

The College had in the 1980's focused on attracting students with both excellent academic records and significant leadership potential. This had been accomplished with a series of scholars programs. These programs provide a rich menu of enrichment activities for students who were accepted into one of the programs. Because of cost, these programs could only accept a small number of (approximately 40) students per year. The college needed to add programs that would enhance the recruitment, retention and academic performance of a larger share of the student body. Three actions were taken. One action reoriented the Introduction to Engineering Course to address student characteristics that frequently lead to attrition.[1] The second action provided a substantial array of enrichment activities outside of the classroom. The third action was the creation of an Engineering Center in the residence halls. This paper focuses on the Engineering Center and the impact it had on engineering students in the College.

From both internal unpublished surveys and external sources [7,11] it was known that parents and teachers of science and mathematics courses have a significant impact on students' selection of engineering as a major. Therefore, it was important to design the Engineering Center to be attractive to these influential people as well as effective with students and attractive to prospective students.

Surveys [3] of Oklahoma State University students have shown that engineering, architecture and engineering technology students must study substantially more hours per week than do students in any other discipline. Thus, it was considered important to have an environment to facilitate the longer study hours.

Numerous studies have shown factors other than academic ability are critical to the retention of engineering students. [1,4,5,9,10,11,12,13] The Engineering Center was specifically designed to address several of these issues including: help the students to form a community within the institution; increase student academic effort and learning; reduce the perceived curriculum overload in engineering; provide alternative instruction when the instruction by science, math or engineering faculty was perceived to be poor; provide additional help and advising; and help the students to achieve a greater knowledge, for which they earn higher grades and therefore reduce the morale deterioration which may occur. The specific objectives for the center were to: enhance recruiting through a demonstration that the college is helping students to succeed; improving retention rates; and enhancing student learning.

Engineering Center Project

The Engineering Center is a residential-based learning community. The students live with other engineering, architecture and engineering technology students. It was established on several floors of the Kerr-Drummond high-rise residence hall so that students in the Engineering Center also interacted with students in other academic programs. Each year the number of floors increased and in 2001, the Allen suites and South Bost apartments were added for men and women. In addition to the residence hall assistants that are normally included in the housing units, another person, an engineering liaison, was added in each cluster to provide academic assistance. Periodically engineering faculty, advisors, and administrators are invited to share a meal with the students and to discuss items of interest to the students. Higher quality study conditions are maintained in the engineering units because all of the students are in a rigorous curricula.

The second major component of the Engineering Center is supplemental instruction in courses that have been identified as potential roadblocks. The supplemental instruction sessions are referred to as "academic workshops." For each course in which the students identify a need for an academic workshop, a session is scheduled one night each week. The sessions are open to all engineering students, but are held in one of the residential units thus making it more convenient for students in the engineering center. A workshop facilitator is assigned to each course. Facilitators are teaching assistants who are very competent in the course material and are proven high quality instructors. These persons work closely with the course instructors to coordinate academic workshop activities with the course. The facilitators provide explanations of difficult concepts and assist students to develop good problem-solving techniques. The facilitators do not solve assigned problems for the students, but help students to find answers and to develop successful problem solving techniques. Success of the academic workshops depends on cooperation with the course instructor. Courses in which the instructor works closely with the facilitator and encourages students to attend these sessions have generally had overflow crowds of students. Without the instructor's cooperation, results in the academic workshops have been disappointing. The academic workshops outgrew the space available in the living units and were moved to public areas of residence halls. Later they had to be moved to classrooms. Student participation in the workshops dropped substantially when they were moved to classrooms. The classrooms are less accessible for students living in the engineering center and some students were concerned about personal safety when crossing campus at night.

A third component of the Engineering Center was the location of a computer laboratory in the residential unit. Students are assessed a technology fee and in return computer classrooms and open computer laboratories are made available for student use. All of the classrooms and most

of the open labs are located in engineering academic buildings. A smaller open laboratory was created in the residence hall with 24 hour per day, seven days per week identification card access. This lab, like the others, is available to all students enrolled in courses taught by the college. However, because of the location this laboratory is primarily used by Engineering Center students. This laboratory was originally located in the individual residential units, but the demand quickly outgrew the available space and the resources were moved to a common location in the public area of the Kerr-Drummond residence hall.

Estimated annual operating expenses for the Center are listed in Table I. Some of the listed expenses were not additional costs. For example the computer room facilities would have been added at another location to expand the available computer seats if the residential life space were not available.

Results

Demand for living accommodations in the Center has grown steadily. In 1997 there were three floors for men and one floor for women in the high-rise residence hall. By 1999 there were five floors for the men and three floors for women in this same residential hall. Part of the growth was due to upper class students continuing in the Center. Most students who are not in the Engineering Center live in the residence hall for the first year and then move to other housing, but students in the Engineering Center have tended to stay there for additional years. In the fall of 2001 the space was expanded to include newly constructed apartment and suite buildings.

There is anecdotal evidence that the Engineering Center enhances recruitment. The best evidence is the growing number of requests from new students. In addition, both potential students and parents visiting campus have been excited about the potential for the students to live in the Engineering Center. Many have expressed surprise at the priority given to student success.

Evaluations of the learning improvements facilitated by the Center have generally, but not always, been very positive. Instructors who have worked closely with the academic workshop program report a sharp decrease in the number of students performing below the passing level in their courses. Several have also reported the fraction of students performing at the "B" level increased significantly when the academic workshops were available. Each of the courses for which an academic workshop has been implemented have in excess of 100 students per semester, so the grade performance typically is consistent from semester to semester unless there is a major change in the learning environment. The neutral evaluation came from a study of test scores for those students who did not participate in the academic workshops until after they had done poorly on one or more examinations. For this group of students, their academic performance before and after attending the academic workshops was comparable (not significantly improved) relative to the rest of the class.

The Oklahoma State University Office of University Assessment conducted a satisfaction survey of 134 randomly selected students in courses served by the academic workshops. [6] This survey found that 69% of the surveyed students attended the academic workshops at least occasionally. Of those who did not attend, time or schedule conflicts or lack of information about the workshops were the primary reasons given. Of the students who attended the workshops 94% indicated they would recommend the workshops to their friends and peers, 88% indicated they plan to attend similar workshops for courses they took in the future and 80% reported the workshops helped them improve their grades and understand and apply concepts from the class.

A similar percentage reported they could understand and organize the course material better; identify relevant information; correct erroneous theoretical concepts from the lectures; and better relate abstract mathematical representations with real problems as a result of attending the workshops.

Retention rates for engineering students living in the Center are substantially higher than for other engineering students. In Table II the retention of students in the Center with all other engineering students by classification for the years 1998 through 2000 is compared. Retention is measured both by continued enrollment or graduation in engineering and by continued enrollment or graduation from Oklahoma State University. Obviously, the latter numbers are somewhat greater than the former, but for either measure for all four student classifications and for all three years, the retention of students in the Engineering Center is significantly higher than for other students.

Students self-select to participate in the Engineering Center. Hence, it is probable that those selecting to participate may be more prone to continue as engineering students. Our data does not allow us to partition this effect from the direct impact of the Engineering Center activities on student retention. Regardless of the cause and effect, it is clear that students participating in the Engineering Center are more likely to graduate from the university and much more likely to graduate in engineering than students who do not participate in the engineering center.

Many, but not all previous experiments with residential learning units have reported improved retention rates.[5,9,10] Another residential learning community project called FIT at Oklahoma State University had much less favorable results. The FIT program had objectives of improved academic achievement, persistence, and psychosocial development. The housing for these students did not encourage interaction with students from other disciplines. The program required group participation in 54 events (cultural, social, community service, sports, student clubs, tutoring, and leadership development) during the year. Students in the FIT program had several homogenous traits: all were in an agriculture program, 96% were Caucasian, and most were from similar social economic conditions. A study of the program [2] indicates that the students performed academically at a lower level, but were initially retained at a higher level than students outside the program. This may be a result of many required non-academic activities and the community development within the group. The FIT students appeared to regress psychosocially based on pre and post evaluations by the Student Developmental Task and Lifestyle Assessment instrument. This is attributed to the cloistered environment created by the program.

The Engineering Center will continue to evolve. Student feedback is sought continuously and used to modify the program.

Conclusions

a) A residential learning unit for engineering students can improve student retention and enhance student recruitment.
b) The development of community among the students is important but should not exclude interaction with students in other academic disciplines.
c) Encouraging non-academic activities is valuable for student development, but should not replace academic study time.

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TABLE I. Estimated Annual Operating Costs for the Engineering Center

Cost Item	Annual Expense	Funding Source
Project Coordinator	$3,500	Student Services Office
Computer Facilities	$32,000	Student Technology Fee
Workshop Facilitators	$19,200.	College
Engineering Liason	$4,450	Residential Life and the College
Space	NA	Residential Life

TABLE II. Average Retention of Students Living In or Outside the Engineering Center Based on Students Enrolled in the Fall 1998-2000 Semesters And Their Enrollment or Graduation by the Following Fall

Retention Basis	Participation Basis	Enrolled Fall of Year	Freshmen		Sophomore		Junior		Senior	
			No.	%	No.	%	No.	%	No.	%
Continued Enrollment In or Graduation From the College of Engineering, Architecture and Technology	**Engr. Center Students**	1998	132	75	55	89.1	24	91.7	5	100
		1999	132	75	56	87.5	19	94.7	13	100
		2000	130	81.5	53	94.3	10	100	13	100
		3 yr. Total	**394**	**77.2**	**164**	**90.3**	**53**	**95.5**	**31**	**100**
	All Engineering Students	1998	524	62.4	412	73.3	431	85.1	685	88
		1999	521	61.8	391	75.5	469	84.9	678	93.1
		2000	480	60.6	419	76.1	405	85.4	707	92.8
		3 yr. Total	**1525**	**61.6**	**1222**	**75.0**	**1305**	**85.1**	**2070**	**91.3**
Continued Enrollment In or Graduation From Oklahoma State University	**Engr. Center Students**	1988	132	84.1	55	94.5	24	95.8	5	100
		1999	132	90.9	56	98.7	19	100	13	100
		2000	130	93.1	53	98.1	10	100	13	100
		3 yr. Total	**394**	**89.4**	**164**	**96.9**	**53**	**98.6**	**31**	**100**
	All Engineering Students	1988	524	77.7	412	85.4	431	89.6	685	88.9
		1999	521	78.7	391	87.7	469	91	678	94.5
		2000	480	79.4	419	87.1	405	91.9	707	93.9
		3 yr. Total	**1525**	**78.6**	**1222**	**86.7**	**1305**	**90.8**	**2070**	**92.4**