

AC 2009-1922: INTEGRATING A FIRST-YEAR ENGINEERING PROGRAM WITH A LIVING-LEARNING COMMUNITY

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Integrating a First-Year Engineering Program and a Living-Learning Community

Introduction

Over the past three years, the College of Engineering at Michigan State University (MSU) has been planning and developing an integrated combination of a first-year engineering program and a residential living-learning program. The synergy of the two is intended to build community and develop broader skills beyond those in a more traditional first-year engineering program.

The academic portion of this integrated program, Cornerstone Experience / Spartan Engineering, consists of two introductory courses. The first, EGR 100, Introduction to Engineering Design, provides a set of broad, team-based, hands-on design experiences and an introduction to topics common across all engineering disciplines. This course is required of all incoming engineering majors. The second course, EGR 102, Introduction to Engineering Modeling, introduces problem solving and mathematical modeling of engineering problems and systems. It is required of all majors except computer science and computer engineering. Much of the Cornerstone Experience / Spartan Engineering program has been developed from common themes contained within first-year courses previously offered by the six individual engineering departments and nine engineering degree programs.

For over 10 years, the MSU College of Engineering has been the lead college in an engineering and science residential program where students reside in a single residence hall. In addition to the inherent social and academic advantages, these students are also afforded the opportunity to enroll in reserved class sections, attend engineering seminars held in the residence hall, and obtain free tutoring in math and science courses.

Our new program, Residential Experience / Spartan Engineering, will transition that small-scale science and engineering residential program of approximately 150 students to a large-scale living-learning community program with a potential to accommodate more than 1000 undergraduate engineering students. It will also integrate with the Cornerstone Experience / Spartan Engineering program into a single facility.

Starting Fall semester 2009, approximately 400 of the 650 incoming freshman engineering students will be housed in a single residence hall containing the Cornerstone Experience / Spartan Engineering lecture auditorium, newly-constructed computer and project labs, and other program facilities. Our intent is to develop a living and learning environment that will assist students in thinking analytically and to succeed in the College of Engineering. This community is intended to bring another dimension to our common first-year curriculum and will further enhance student knowledge of the engineering profession, cultivate their problem solving skills, connect them with campus and community resources, and enhance their communication skills. Because students will live in the same residence hall community, it is hoped that an academically supportive peer group will enhance the overall experience.

Such integration does not come easily. A coordinated plan has been developed to join the Cornerstone Experience and the Residential Experience to address the challenges encountered by

the development and implementation teams. These issues include facility location and composition including design and construction, gender balancing in a residence hall with predominantly engineering degree program students, segregating engineering students or mixing with other majors on single residence hall floors, development of mentoring programs within and outside academic courses, program and course scheduling and phase-in, faculty recruitment and retention, integration with non-academic university departments, faculty consensus on course approach and content, and course credit counts and integration into existing degree programs.

MSU Background

Michigan State University, founded in 1855, is located in East Lansing, Michigan. It has served as the prototype for 69 land-grant institutions established under the Morrill Act of 1862. It is comprised of a 5,200-acre campus with 2,100 acres in existing or planned development containing 579 buildings, including 85 with instructional space.¹

The University offers more than 200 programs of study offered by 17 degree-granting colleges. Its student enrollment (fall 2007) totaled 46,045 with 36,072 undergraduate and 9,973 graduate and professional students. Of these, 54 percent were women and 46 percent men. Minority representation consists of 7.4 percent African American, 5.1 percent Asian/Pacific Islander, 2.8 percent Chicano/Other Hispanic, and 0.7 percent Native American. The University has approximately 4,800 faculty and academic staff as well as 6,100 support staff employees.

The College of Engineering is comprised of 6 departments offering 9 undergraduate degree and 9 graduate degree programs. The College has 2,812 undergraduate students, 189 MS students, and 394 PhD students instructed by 162 faculty. In 2007, 513 BS degrees were awarded by the College.²

Program Motivation

Retention of early engineering students has been identified as a nation-wide concern that will affect the strength of the future engineering workforce and, hence, the role of the United States as a dominant world player in engineering and technology.³ This becomes a major challenge as we address the current global fiscal downturn and the technological advances needed to stimulate the national and world economies.

Over the last decade, enrollments have declined substantially in the MSU College of Engineering. This decline exceeds the national average largely due to the reduction in the manufacturing industry in our state. We believe increasing the number of undergraduate engineers can be accomplished by recruitment, engagement, retention, or a combination of all. The primary goal of the Cornerstone Experience and Residential Experience / Spartan Engineering programs is to address these recruitment, engagement and retention issues.

Living-Learning Communities

Living-learning communities are increasingly prevalent on college and university campuses.^{4,5} These communities are regularly used for making large campus environments smaller and more

personal, creating opportunities to integrate classroom learning with out-of-class activities and connect students more closely with one another and faculty. Several research studies found many academic, involvement and environmental gains for students in living-learning communities in comparison to their traditional residence hall peers.^{6,7,8}

Living-Learning Communities at MSU

The main thrust of the MSU residential colleges is to provide a unique combination of a small-college environment with the rich diversity of a major research university. Students with similar interests are able to live and study together. Often, faculty offices are housed in the residence halls, providing easy access for students. This togetherness fosters strong relationships among students. They are able to form study circles and assist each other with homework and other projects. In addition to student leadership opportunities, sports competition, and social events, the MSU living-learning communities regularly offer related academic and cultural programs, speakers, and other extracurricular activities.

MSU has a long history of providing its students with living-learning options with 8 programs available for its students. They include Academic Scholars, Lyman Briggs College, Broad Residential Option for Academic Distinction (BROAD) Freshman Program, the Honors College, James Madison College, the Residential College in the Arts and Humanities (RCAH), Residential Initiative on the Study of the Environment (RISE), and Residential Option for Science and Engineering Students (ROSES). Students in these programs are assigned to residence halls with other students in the program. Each of the programs combine curricular and co-curricular elements to enhance the student experience. Enrollments for the various programs are given in Table 1 below. Summary details of each program are given following the table.

Program	Number of Freshmen	Total
Academic Scholars	229	432
Lyman Briggs	625	1826
BROAD	100	100
Honors College	465	2660
James Madison	333	1259
RCAH	108	116
RISE	32	180
ROSES	110	110

Table 1: Enrollments in MSU Residential Programs

Academic Scholars

The Academic Scholars Program is designed for high-achieving freshmen and sophomores interested in enhancing their academic program during their first two years of college, and who may be interested in joining the Honors College after their first year. This program provides opportunities for qualified students to begin substantial Honors work from the start of the freshman year, and to interact more frequently with both faculty and students who share similar academic talents and interests.⁹

Lyman Briggs College

The Lyman Briggs College is a residential learning community devoted to studying the natural sciences and their impact on society. In a single facility, the college encompasses physics, chemistry, biology, and computer laboratories; classrooms; faculty, administrative, and academic support staff offices; as well as student residences.¹⁰

Broad Residential Option for Academic Distinction (BROAD) Freshman Program

Business students participating in the Broad Residential Option for Academic Distinction (BROAD) Freshman Program live in a single residence hall and have roommates also in the program. These students are able to enroll in reserved sections of high-demand freshman classes, such as writing, arts & humanities, and communication. They also have the opportunity to participate in a variety of professional development activities such as freshman seminars, career seminars, tutorial services, professional development, and special events.¹¹

The Honors College

The Honors College serves academically talented students who wish to pursue and achieve academic excellence. The College strives to ensure an enriched academic and social experience for its members and to create an environment that fosters active, innovative learning. The Honors College programs emphasize individualized academic programs. Many Honors College students live on designated Honors College floors within the entire University residence hall system.¹²

James Madison College

The James Madison College offers multidisciplinary programs in the social sciences founded on a model of liberal education and designed to prepare students for law school, graduate study, decision-making roles in public and private enterprise. Students examine how public policy problems are identified, analyzed, and resolved in the United States and globally.¹³

Residential College in the Arts and Humanities

The Residential College in the Arts and Humanities (RCAH) is an interdisciplinary college for undergraduate students interested in the global connections between literature, history, ethics, culture, world languages, the visual and performing arts, and their own civic engagement in these fields of work and study. Students, faculty, visitors, and staff are able to explore modes of expression in several workshops, tutorials, and seminars.¹⁴

Residential Initiative on the Study of the Environment (RISE)

The RISE Residential Program is for incoming freshmen who are interested in stewardship of our environment. The program offers students a community of learners with shared academic and career goals within the larger context of the university. RISE students also enroll together in special reserved sections of chemistry, math, writing, and biology.¹⁵

Residential Option for Science and Engineering Students

The Residential Option for Science and Engineering Students (ROSES) is an academic, social and residential program intended for those who express interest in a program with an engineering or science identity. ROSES students live in a common residence hall and participate in one-credit seminars intended to introduce strategies and skills for academic success and to explore possible paths of career development. Several common first-year courses offer sections reserved for ROSES students.¹⁶

Residential Experience / Spartan Engineering

As discussed above, MSU is a university that values living-learning programs, and is a leader in same. We have a college administration interested in providing an experience that will allow students to be engaged early on. Our intent is to develop a living and learning environment that will assist students in thinking analytically and to succeed in the College of Engineering. The engineering living-learning program at MSU, Residential Experience / Spartan Engineering, is intended to develop a community to bring another dimension to our common first-year curriculum and further enhance student knowledge of the engineering profession, cultivate their problem solving skills, connect students with campus and community resources, and enhance their communication skills.

In early 2006, the College assembled a team to study the living-learning programs within the University as well as the first-year programs offered at other schools. Their charge was to develop a plan for an integrated first-year engineering experience with a residential program. After much research and data collection, the development team proposed that the MSU first-year engineering program that would have two key components:

1. An integrated set of freshman engineering courses that would provide early engineering students with a broad introduction to engineering design, the engineering profession and its expectations, engineering problem solving skills and teamwork skills in a hands-on environment.
2. An optional residential experience, expanded significantly from the present ROSES program, designed in a way to attract more than half of entering freshman to live in a common residence hall, and to retain a significant number of sophomores in the hall.

In addition to the key components, the development team assembled a list of program requirements that would be critical to the program's success. These requirements were:

A location close to the Engineering Building (e.g. Holden, Wilson or Holden Halls)

Renovation to provide facilities such as engineering computer labs, project design labs, advising offices, offices for faculty office hours, student organization offices, and tutoring and team study areas. Properly configured, these features would encourage upper-class students to continue to use the facilities, and thus encourage a sense of community extending beyond the freshman level.

The development team also assembled a list of discussion items deemed critical for the success of the program in attracting top students to our engineering programs and retaining them. They identified key factors in maintaining and improving student and program quality. Those included:

Moving to a more common freshman engineering curriculum will require effort and change on the part of every department and program – some have already invested much in their own courses, while others are just starting.

College administrators (deans and department chairs) need to firm up the staffing and funding model that will be used for the program.

Developing an excellent program will require a significant commitment of facilities, either renovations of a residence hall or new engineering space with a nearby hall.

Program Needs

In the development of the Residential Experience program, the team identified various specific needs in addition to those found within any residence hall. Those identified were:

- Advisors
- Career personnel
- Classroom space
- Student organization space
- Meeting space
- Lounges and other study and gathering areas
- Service learning space

Facility Location and Composition

Determining a location for the new Residential Engineering program required review of existing residence halls to determine satisfaction of program needs. Existing halls of choice were to be within close proximity to the MSU Engineering Building to facilitate student and faculty movement between the two buildings. The building chosen was Wilson Hall. This facility houses nearly 1000 students. It is our intention to place 400 first-year engineering students in the hall fall semester 2009. Residence hall history indicates approximately 50% of first year students remain in the University residence hall system after their first year as opposed to living off-campus. Using this trend, we estimate 200 of our incoming class of 400 will remain in Wilson Hall for the 2009-10 academic year bringing our population to 600 students for that year.

It should be noted that the Residential Experience will not be a single residence hall, such as the many other MSU living-learning communities. Incoming, first-year engineering students will not be required to live in Wilson Hall. But, with much of the Cornerstone Engineering program housed within that facility and the proximity to their engineering peers, it will be very convenient for students co-locating facilities.

Locating 400 first-year engineering students to live in a single residence hall is not that great a challenge. All of our first-year students, regardless of major, live in the University housing system. This is mere shifting of students distributed across the entire system to a single residence hall. Our new program will have no net effect on the overall University housing population.

New Facilities

In July, 2008, two laboratories were constructed in the designated residence hall. The first was a 37-seat computer laboratory equipped with dual monitored personal computers, conference tables for team meetings, and an instructor's station. This laboratory occupies approximately 2400 square feet on the ground floor of the residence hall. A schematic of the laboratory layout and a picture of its contents are shown in Figure 1 below.

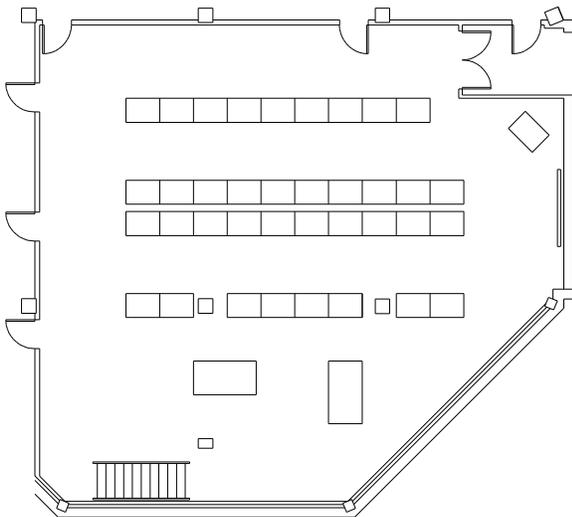


Figure 1: Cornerstone Engineering Computer Laboratory

The second facility, also constructed in July, 2008, was a project assembly lab equipped with drill presses, band saws, sanders, a horizontal saw, benches and associated hand tools. This facility occupies approximately 1600 square feet also on the ground floor of the residence hall. A schematic of the laboratory layout and a picture of its contents are shown in Figure 2 below.

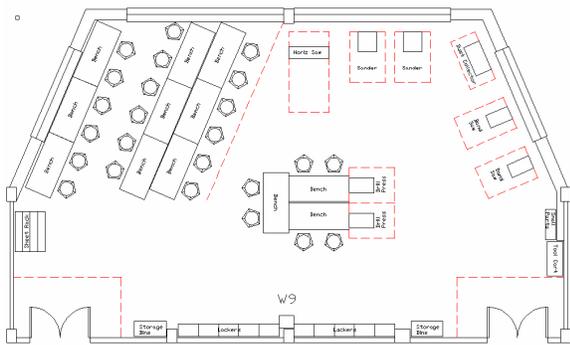


Figure 2: Cornerstone Engineering Project Assembly Lab

A suite of offices has been designated near the computer and project labs for instructional staff, graduate teaching assistants and upper-level undergraduate mentors.

When locating a large program and its respective students within a new or renovated facility, many needs arise for housing of services and administration. In addition to newly renovated and planned classroom and laboratory space, office and other facility needs exist for program administration, instruction and support staff, academic advising, and other support services.

Residence Hall Gender Balancing

The gender distribution of students at MSU is approximately 54% female and 46% male. However, the average gender distribution of incoming freshmen engineering students is approximately 15% female and 85% male. For an incoming class of 650 engineering students, nearly 100 will be female. For our plan to populate the residence hall with 400 first-year students, all of the incoming female students will be advised to live in the designated residence hall. With that said, the remaining 300 incoming engineering students will be male. In order to maintain an approximate gender balance within the residence hall system, we will need to supplement the 400 engineering students with 200 female students from other majors.

Segregation/Integration of Students

It is not the intention of the framers of the Residential Engineering program to place all first-year engineering students together on designated floors of the residence hall. Ideally, engineers will share rooms, wings and floors with students from all majors. It is our intent that engineering students will live with and share floors with students from business, law, natural science, etc. The diversity of disciplinary perspectives will be educationally beneficial and will mirror the environments many engineers experience in their careers. We also plan to solicit corporate sponsorship for themed floors where students of various majors having interest in a particular topical theme may live together and also participate in activities such as invited talks from experts.

Mentoring Programs

In addition to the in-class mentoring being done in both of the academic courses, it planned to develop a mentoring program within the residence hall such as has been done in the other University residential programs. This would include both academic and social activities as well as involvement with the student professional organizations.

Academic Program

With the experience of 8 residential and living-learning programs already established on the MSU campus, the Residential Experience / Spartan Engineering development team sought to establish an academic program as well as a fully-supported residential program. The first step was to develop a set of common, first-year courses to be taken by all incoming engineering students regardless of major or discipline. Two courses were developed and implemented. The first, EGR 100 Introduction to Engineering Design, is to be taken by all first-year engineering students regardless of major or participation in the Residential Experience. The second course, EGR 102 Introduction to Engineering Modeling is to be taken by all engineering majors with the exception of computer science and computer engineering.

EGR 100 Introduction to Engineering Design is a two-credit course taught in a lecture and laboratory format. Lectures are held once each week for 50 minutes throughout a 15 week semester. The laboratory sessions also meet once per week for 110 minutes each. The instructional team is composed of faculty members from each of the nine engineering programs in the College. Each member of the team develops and presents at least one of the lecture sessions during the semester. In addition, graduate student teaching assistants are charged with conducting the laboratory sessions. A group of three undergraduate mentors per lab section, mostly juniors and seniors in their respective majors, aid the students with homework and projects during the laboratory sessions. Lectures are held in a traditional auditorium, whereas the laboratory sessions are held in the newly-constructed computer facility populated with Windows[®]-based PCs.

The lectures primarily deal with the various aspects of the engineering profession. Topics include the engineering disciplines, communication, professional resources, engineering calculations, energy, time management, design methods, problem solving, and ethics. Two lecture examinations are given, covering the lecture materials.

The laboratory sessions concentrate on application of the lecture topics with utilization of various computer tools. The sessions have individual and group work portions. Each week, students learn and practice technical writing and presentation skills using Microsoft[®] Office[®] products. Excel[®] calculations and plotting are also taught. The students work on this portion of the laboratories individually. At the end of each lab session, a certain amount of time is allotted to group work.

Throughout the semester, students use the project lab in which to build their projects. The students have supervised access to the facility during their laboratory sessions and during specified out-of-class hours. As the majority of first-year students live in the residence halls, this

facility is necessary for student teams to complete their projects. The supervisors in the project lab instruct the students on the best and safest ways to operate the machinery. They provide help and suggestions on the most effective ways to produce the student's designs. The lab includes simple machining equipment; such as basic tools, drill presses, band saws, and belt sanders. The lab also has some construction materials available to the students.

EGR 102 Introduction to Engineering Modeling is a two-credit course also taught in a lecture and laboratory format. The lectures meet once per week for 50 minutes while the lab sections meet twice per week for 80 minutes each. This course is comprised of lectures introducing numerical methods techniques for solving engineering problems as well as laboratory sessions instructing students on the usage of computer tools, such as Excel[®] and MATLAB[®], to solve engineering problems using iterative techniques. This course concludes with a three-week, team-based project involving the development of a multi-module simulation model. The current project has student teams model a water system comprised of an aquifer-fed lake/river system supplying industrial, agricultural and urban water usage needs.

As with the EGR 100 course, graduate student teaching assistants are charged with conducting the EGR 102 laboratory sessions. And, as with EGR 100, a group of three undergraduate mentors per lab section again aid the students with homework and projects during the laboratory sessions. Lectures are held in the same auditorium as EGR 100 and the labs in the same computer facility.

EGR 100 Projects

Throughout the entire semester, EGR 100 students are occupied with team projects, independent of the individual work assigned them during the lab. The projects consist of a two-week, team building project; a four-week topical, multidisciplinary optimization project; and an eight-week open-ended design project. The student teams are randomly selected on the first day of class. Students are given the opportunity to modify their teams between projects. However, most teams remain intact throughout the three projects. All of the projects involve the construction of either a functioning prototype or a simulation model.

The first team project is assigned during the initial lab session with the student teams given two weeks for completion. This project is designed as a competition in order to add some extra motivation. Due to the students' limited engineering knowledge and experience, the problem addressed requires the completion of a simple task which is then validated by the construction of a device or prototype. The current model for this project has the student teams design and construct nutritionally-balanced, edible "cars" in which the teams "race" against one another by rolling their vehicles down an incline. An example of one of the student team cars and the race incline may be seen in Figure 3 below.

The second EGR 100 project, which has a four-week duration, has the student teams use some introductory engineering design and calculation methods developed through the lecture portion of the course to conduct an optimization exercise. The student teams develop simulation models to validate their optimization. The current second project has the teams compute, and then minimize through evaluation of several concept designs, their combined carbon generation,

salary and travel costs required to attend a conference at a designated international location. The student teams determine their optimum travel itineraries, present their results to their course peers, and submit formal engineering reports detailing their proposed solutions.



Figure 3: EGR 100 Project 1 Edible Car and Racing Incline

The third EGR 100 project involves an eight-week, open-ended design problem. Student teams are to design and prototype a product or device that would be marketable to a first-year college student living in a residence hall. The designs are to have a material cost of no more than \$20 to prototype and an expected retail cost of no more than \$50. Many of the student projects concern storage or space-saving devices. Again, the student teams present their results to their course peers, and submit formal engineering reports detailing their proposed solutions. Figure 4 below shows a student team with their loft storage shelf prototype.



Figure 4: EGR 100 Project 3 Design Team and Prototype

Project Lab Safety

With the student teams working with machines and tools in the project lab, personal safety is of major concern. All course students, graduate student teaching assistants and undergraduate student mentors are instructed by a trained professional on the proper operation of all lab equipment. Following training, students complete a safety form indicating their agreement to abide by all lab safety rules. Additionally, students are required to have all equipment setups inspected and approved by a teaching assistant supervising the lab facility prior usage of any equipment. The lab is staffed by no fewer than two trained employees during all open hours.

Course Scheduling and Phase-In

The first course, EGR 100 Introduction to Engineering Design, was piloted during the fall semester, 2007, with 39 students distributed across 2 laboratory sessions. It was then piloted again in spring semester, 2008, with 44 students again distributed across 2 laboratory sessions. The course was then offered in a large scale during the fall semester 2008, with 465 students distributed over 13 laboratory sections. During spring semester 2009, the course had 195 students divided into 6 laboratory sections.

The second course, EGR 102 Introduction to Engineering Modeling, was piloted spring semester, 2008, with 30 students distributed over 2 laboratory sections. It was piloted again fall semester 2008 with 46 students, again with 2 laboratory sections. Large-scale offering of the courses began in spring semester 2009 with 312 students divided over 10 laboratory sections. Enrollments for the pilot and initial large-scale offerings of both courses may be found in Table 2. Our projected estimates for steady state course enrollments are shown in Table 3 below.

Course	Fall 2007	Spring 2008	Fall 2008	Spring 2009
EGR 100	39	44	456	195
EGR 102	-	30	46	312

Table 2: Pilot and Large-Scale Course Enrollments

Course	Fall	Spring	Summer
EGR 100	504	216	-
EGR 102	216	360	72

Table 3: Steady-State Large-Scale Course Enrollments

Faculty Recruitment and Retention

Instructional teams have been developed for the two introductory courses. For the EGR 100 course, the instructional team is comprised of faculty representing the College's 6 departments and 9 degree programs. A lead instructor has been identified and charged with organization and

management of the course. The instructional team plans and develops the course lectures as well as the laboratory projects and assignments. As teaching and other departmental assignments change for team members, new representatives from the degree programs are welcomed to the instructional team. All programs are required to have representation on the team at all times.

For the EGR 102 course, an instructional team was assembled with representatives from the engineering departments other than computer science. In this course, instruction is done on a semester-by-semester rotational basis. Again, lecture material and laboratory assignments and team projects are developed by the team.

Student Affairs Services

The College of Engineering at MSU has a strong history of academic advising, employing seven full time professional advisers and one graduate student. The advising operation is overseen by a Director of Advising. Although advising models have shifted slightly over the last several years, the one consistent factor has been to have a specific adviser assigned to each major in the college. Having this arrangement allowed for advising of freshmen through senior students in that major, as well as a steady presence in the department to interact with faculty. In addition, most advisers are in offices that are physically located near department faculty and chairpersons. This configuration seemed to work well when engineering students lived all over campus and the surrounding community. However, the transition to the Residential Experience will give the College of Engineering access to a large number of incoming students, as well as physical space, all located under the same roof.

A key component to academic success in college is student involvement in their collegiate environments.¹⁷ In addition, students who make early and consistent contact with faculty and staff are more likely to persist to graduation.¹⁷ Student involvement can come from a variety of sources, including access to academic resources like advising, tutoring and peer study groups.¹⁸ Although these resources existed in various forms throughout the College of Engineering, the new facilities associate with the Residential Experience gives MSU College of Engineering an ideal environment for executing a shift in student services.

In an attempt to provide academic advising to Residential Experience students that will enhance their connections to staff and academic services, the current model of advising will be adapted. Advising assignments will be shifted to a model where all first year students will be advised by three advisers physically located in the new residential space. These advisers will be carefully selected from the staff, all who have an interest in, and prior experience working with first year students. Having the academic advisers located in the living-learning community will provide for students the opportunity to see their academic support staff where they live and take courses. In addition, the advising staff will provide different hours of service throughout the week, outside of the normal 8am-5pm workday. And, the job description of the hall director has been modified from a traditional hall director position to include academic advising responsibilities. The hall director will advise students during the summer orientation program and will maintain some academic advising responsibilities throughout the academic year.

The remaining members of the advising staff will keep their current locations in the main engineering building. Most of the junior and senior engineering students at MSU have the majority of their classes in this main building, and often stop in for advising appointments between classes. As students move to graduation and degree certification, having these upper level advisers physically located in their departments will maintain the consistency that faculty have come to appreciate over the years.

Moving advising services to the new location will give the Residential Experience students a greater opportunity to make meaningful connections with their academic advisers. Part of student persistence through to graduation is making these faculty and staff connections deliberate and consistent.^{17,18} It is our vision that giving the Residential Experience students a dedicated advising staff will be another factor in aiding in their retention.

Program Assessment

Student recruitment, engagement and retention have been identified as major goals of the Spartan Engineering programs. Several years of data have been collected which, when reduced to specific usable forms, will serve as benchmarks for pre-program methods and results. Success of the new programs will be determined by increases in those indices. Some initial survey tools have been developed and administered to the current program participants. However, that data has not yet been analyzed. Additionally, many of the specific measurement tools we will use are still under development. It should be noted the College currently has an assessment team in place examining not only the results of the Spartan Engineering programs but also that of other recruitment, engagement and retention initiatives. Results of their findings will be made available as data is collected and analyzed.

Conclusions and Recommendations

As discussed, we are only in the beginning stages of developing the Residential Experience/ Spartan Engineering program. Our two introductory courses are in place, as well as our first labs to support those courses. Our development and instructional teams have spent over 3 years in the planning and implementation of our academic goals.

Over the next year, we will begin the second phase of our program development by constructing additional classroom, laboratory and active learning facilities. We will also finalize the implementation of the residential portion of the program with bringing in 400 freshman engineering students to a single residence hall. We will also have in place the various required support services such as advising, tutoring, career services, etc. necessary for that student population.

Bibliography

¹ <http://www.msu.edu/thisismsu/facts.html>

² <http://www.egr.msu.edu/about/facts>

³ “The Engineer of 2020: Visions of Engineering in the New Century,” National Academy of Engineering, National Academies Press, 2004.

⁴ “Living-Learning Centers: Offering College Students an Enhanced College Experience,” Journal of College and University Student Housing, 1994, J. Arminio.

⁵ “Residence Arrangement, Student/Faculty Relationships, and Freshman-Year Educational Outcomes,” Journal of College Student Personnel, 1981, E. Pascarella and P. Terenzini.

⁶ “Different by Design: An Examination of Outcomes Associated with Three Types of Living-Learning Programs,” Journal of College Student Development, 2003, K. Inkelas and J. Weisman.

⁷ “The Impact of College Residence on the Development of Critical Thinking Skills in College Freshmen,” Journal of College Student Development, 1998, P. Inman and E. Pascarella.

⁸ “The Effects of Residential Learning Communities and Traditional Residential Living Arrangements on Educational Gains During the First Year of College,” Journal of College Student Development, 1999, G. Pike.

⁹ <https://www.msu.edu/~asp/>

¹⁰ <http://www.lymanbriggs.msu.edu/>

¹¹ <http://www.bus.msu.edu/undergrad/bfp.cfm>

¹² <http://honorscollege.msu.edu/about/index.html>

¹³ <http://jmc.msu.edu/quickfacts.asp>

¹⁴ <http://rcah.msu.edu/>

¹⁵ <http://naturalscience.msu.edu/students/rise/>

¹⁶ <http://www.egr.msu.edu/future-engineer/life/residential>

¹⁷ “Involvement in Learning Revisited: Lessons We Have Learned,” Journal of College Student Development, 1996, A. Astin

¹⁸ “Leaving College: Rethinking the Causes and Cures of Student Attrition,” University of Chicago Press, 1993, V. Tinto.