The ROSES Program at Michigan State University: History and Assessment

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Abstract

The Residential Option for Science and Engineering Students (ROSES program) at Michigan State University is in its eighth year. This program provides a variety of integrated residential, social and academic for students in their freshman year, aimed at easing the transition to collegiate life and the engineering educational experience. This paper summarizes the objectives, evolution and operation of the program and the results of several program assessments.

Prologue

"The first semester is hard on freshmen and there needs to be a way to prepare us for how difficult it really is. Not all incoming freshmen are clueless, party-going slackers, some struggle very much to achieve a 4.0 and good academic standing without always making it. It is important to know that you can't blow off any of the work or not go to class and still do well."

… Student quote, 1998-99 ROSES student, assessment survey…

I. Introduction

The *Residential Option for Science and Engineering Students* (ROSES) at Michigan State University (MSU) is a residential living-learning program intended to provide a supportive and collegial environment for new freshmen intending to pursue majors and careers in technical fields. Participation in the program is selective for incoming freshmen with majors in the Colleges of Agriculture & Natural Resources, Engineering, and Natural Science. The majority of these students, about 150 of 200, are Engineering majors, with the rest from the College of Natural Science and the College of Agriculture & Natural Resources. The primary components of the program include a common residence hall, a seminar course, reserved sections of common freshmen courses, tutoring and provision of peer leaders in the residence hall. The program has been in place for eight years, providing the opportunity to relate some lessons learned and perform some program assessment.

II. Why a Living-Learning Program? Some Background and History

The enrollment management process at Michigan State University uses a relatively liberal approach to freshman selection of their majors, and a relatively restrictive approach to continuation in a selected major in the junior year. The approximately 6500 students who start MSU every year as freshman are free to declare that they are pursuing any major offered at the University, and the University has traditionally placed a value on the freedom of students to freely explore majors during their first two years. For example, all 6500 freshmen could declare one of the eleven Engineering programs as their intended major. In fact, nearly 1000 do so. However, the availability of faculty, laboratories, classes and other resources required beyond the early years are not kept in balance with declared student interests. Hence, a number of Colleges, notably Engineering, Education, and Business, restrict admission at the junior level and in turn restrict access to upper-level classes to those who have competed successfully for limited upperclass seats. In the College of Engineering, junior enrollments are maintained at 750 to 800 students, including about 100 junior transfers from other institutions. Admission is based on a weighted cumulative-technical gradepoint average at the end of the semester in which a student attains 56 credits. Hence, only about two-thirds of those declaring engineering as incoming freshman are admitted to junior standing.

A well-known concern in Engineering programs is the fact that traditional curricula do not provide much student contact with Engineering courses until their fourth or fifth semester. Figuratively speaking, engineering students are “sent away” to study Calculus, Chemistry, Physics and writing and invited to return if and when they have completed them, done well, and still have an interest in engineering.

Because of the open freshman admissions approach, MSU engineering freshman start their college careers with a broader variety of mathematics courses than freshman in some other engineering schools. Table 1 shows the distribution of freshman mathematics enrollments in fall semester 2000.

Finally, MSU is a *very large* place. As previously stated, it enrolls approximately 6500 freshmen per year, and has a total annual enrollment, undergraduate and graduate, of approximately 43,000.

So, back to the title of this section—Why a living-learning program? A number of other engineering schools have attempted (many with apparent success) to better unify the freshman engineering year with integrated programs which typically combine several curricular topics among Calculus, Physics, Engineering Graphics, Writing and Communication, Computing, and Introduction to Design. Developing such programs generally relies on having a consistent cohort of students who will enter the program together, share their participation in the common freshman experience, and upon successful completion, expect to continue as a class through their upper-level courses. At MSU, it is problematical to implement such a program for two reasons, both related to open-freshman/restricted-junior admission policy. First, as evidenced by the distribution of mathematics courses shown, engineering freshmen are not a homogeneous group, but are concurrently starting the engineering curriculum at a variety of entry points. Secondly, the College

and its Departments have been reluctant to devote significant faculty resources to freshmen courses and experiences when it is recognized that the population may be both larger and different from the one which will ultimately reach their junior and senior level classes.

Table 1
Mathematics Courses Taken by MSU Engineering Freshmen in First Term
(Based on 955 Enrollments in Fall 2000)

Course	**Percent enrolled**	**Cumulative percent, this course or lower**
Remedial Mathematics	7.9 %	7.9%
College Algebra	8.6%	16.5%
College Algebra and Trigonometry	26.5%	43.0%
Calculus I *	42.0%	85.0%
Calculus II *	9.8%	94.3%
Calculus III *	4.3%	98.6%
Differential Equations *	0.2%	98.8%
		(remainder in other classes)

* includes Honors sections

Hence, in 1992, the College of Engineering began looking at what *could* be done to provide more connectivity among at least a subset of engineering freshman. The initial idea was simply to cluster students in common classes, but a model already successful at MSU was the living-learning concept, which had been implemented by two other campus units, the Lyman Briggs School and the James Madison College. The Lyman Briggs School is a degree-granting unit of the College of Natural Science which has all students is the program living in the same dorm, taking classes together, and having professors' offices in the same building or nearby. The James Madison College provides a similar program in international relations. A focus of both programs was to counter the large and potentially overwhelming size of MSU by providing the experience of a "small college on the campus of a big university." The Department of Residence Life at MSU had already developed much experience and expertise in the residential and social side of such programs.

During the 1992-93 academic year, the Department of Residence Life and the Colleges of Natural Science and Agriculture & Natural Resources joined the project. Students were invited to participate on a first-come first-served basis and 142 began the program in Fall 1993. Engineering and Natural Science students were required to enroll in the ROSES seminar, at that time a single large lecture, and five of the Agriculture & Natural Resources students elected to enroll. Students attended a study skills or engineering/science related lecture each week, as well as an evening recitation taught by the Residence Life staff. Upperclass honors students volunteered some hours each week to tutor the ROSES students.

Fall 1994 brought a few administrative changes. Engineering was identified as the lead college, and the Provost's Office promised program funding for the following three years. The seminar (EGR 291) remained in a large lecture format, but the recitation was dropped in favor of Success Seminars which students chose based on their needs or interests. Attempts were made to break down the size of the class by meeting in three large groups, by college, but with 140 students, these groups were still quite large. Upperclassmen in the majors were hired as tutors in the math and science consulting rooms providing a consistent, reliable, and knowledgeable staff.

The concept of the large seminar sections was to get the entire group together and identify as engineering students; however, it became apparent that closer ties to students' intended majors and the increased collegiality afforded by smaller classes was preferable. Accordingly, the ROSES seminar moved to a small-section model in the fall of 1995. Sections ranged in size from 12 to 43; for some of the students, it was the only small class in which they were enrolled their first semester at MSU. Increased satisfaction with the seminar was expressed by the instructors, students, peer leaders and seminar assistants. Increased attempts were made to integrate the academic and residential lives of our students: faculty were encouraged to contact the ROSES coordinators if students failed to maintain regular attendance in a reserved section; resident assistants in Bailey Hall regularly referred students to the consulting rooms; and engineering and science faculty spoke at fireside chats in the Spring Semester.

III. Current Structure of the Program

ROSES is designed to provide a stronger sense of community and academic support within the greater University. Fostered by shared classes and a one-credit seminar, this community inspires and promotes collaborative learning opportunities among participants.

Admission to the program is somewhat selective, but not extremely so. At the time a student who has declared engineering as his or her intended major is notified of their admission to the University, they are sent a card inviting them to apply to the ROSES program. Students with an ACT score of 24 and a high school GPA of 3.30 are automatically admitted, students with qualifications below these requirements, but with ACT scores above 21, are screened on both scores and interests until the available seats are filled. One governing factor in the program size is the number of available rooms in the Bailey Hall residence facility. The screening on students' interest has been implemented in recent years by having them write a brief essay on their reasons for seeking admission to the program.

The current elements of the ROSES program include:

- Approximately 200 students living in the same dormitory, Bailey Hall. About 150 of these are engineering majors.
- A success seminar series in the residence hall.
- Enrollment in common, reserved sections of Calculus I, General Chemistry I and II, Engineering Computing, Biological Science, American Thought and Language (MSU's

introductory writing course), Integrated Arts and Humanities, and Integrated Social Science (the latter three course categories are used to meet MSU's general education requirements.
- Enrollment in small sections of the ROSES freshman seminar.
- A tutoring program emphasizing math and science courses.
- A contingent of peer leaders, typically sophomores who were in the ROSES program the previous year.

Living in the same residence hall provides the setting for the above mentioned academic interactions. ROSES students study together in their rooms, in the lounges, and in the tutoring rooms of Bailey Hall. They seek out academic role models -- the tutors, peer leaders, and resident assistants -- for advice on courses, professors, co-ops, and student groups. ROSES students share a common living and learning experience.

The residence hall seminars are presented by peer leaders, and include topics such as time management, career development, study and testing skills, health management, searching for internships and co-op placements, and science and engineering careers.

The ROSES reserved sections are not exclusively reserved for ROSES students, but blocks of seats are reserved at the time of freshman orientation that are accessible to ROSES students only. Enrollment in common, reserved sections eases scheduling problems for students and ensures that ROSES participants share a classroom with their hallmates. Similar to students at other large, public institutions, MSU students sometimes find that courses have limited openings or are completely full during a given semester. ROSES students generally find ROSES-reserved sections open when other sections of the same course are not. In addition, when they enroll in a reserved section, they know that other students in the program will be enrolled in the same section. The common sections of courses provide an opportunity to form class study groups, share notes with classmates, and work on group projects more easily than if the ROSES students were not in the program.

The ROSES seminar classes have three primary goals 1) to provide an orientation to the students' respective colleges, the University and collegiate life, 2) to introduce students to strategies and skills that can assist in their academic success, and 3) to explore various paths of career development. As noted above, the class format has evolved from one large class with recitation periods, to three (still) large classes, and finally to about seven sections (five in engineering) averaging about 25 each. The ROSES seminars are taught primarily by advising professionals in the College of Engineering, but a few faculty and other instructional specialists have also taught sections. At MSU, heavy reliance is placed on the use of advising professionals rather than faculty advisors for a number of reasons, including the large number of freshman and sophomores, the large undergraduate student/faculty ratio in general, even at the junior and senior levels, the large number of engineering "no-preference" students, and the large number of curricular variations in such a large university. Students in these small sections of the ROSES seminar courses are

generally grouped by similar intended majors (e.g. electrical engineering and computer engineering), with at least one section for engineering "no-preference" freshmen.

Common course requirements for the ROSES seminars include:

- ROSES success seminars—supplemental selective gatherings for which attendance and related requirements add up to 25 percent of the total course grade.
- Writing assignments.
- Oral communication activities.
- Career exploration activities, both general and college specific.
- Exposure to, and use of University resources, such as the library, the JOBTRAK system of the Career Services and Placement Office, and the engineering employer exchange.
- Making connections with faculty, staff and students in the college.
- Use of assigned readings and an expectation of critical analysis.
- An end-of-semester student evaluation of the course and instructor.
- A detailed syllabus including course objectives, policies, requirements and activities.

Specific topics taught in the Engineering sections include communicating with your professors, expectations for written papers, the engineer as a hero, the University and the College, engineering and science ethics, job preparation, the engineering library, exploring MSU's academic resources, the role of the academic adviser in student success, how to get a 3.0 without really trying, test-taking skills, time management for college students, learning styles, personality types, selecting a career, and experiential learning. In the fall semester of 2000, a "disassembly project" was added to initiate a hands-on component similar to those found in more comprehensive freshman engineering programs. Students disassembled, investigated and reported on the design and inner workings of items such as telephones, answering machines, light switches, and cameras, and with mixed success, reassembled the same.

The tutoring program is provided through open math and science consulting rooms, open from 6:00 to 10:00 pm, Sunday through Thursday. MSU students who have performed well in these courses are hired on an hourly basis to answer concept questions and help students through the material without actually doing the work for the student.

The peer leaders are former ROSES students who applied for and were hand-picked to serve in

this role. Their mission is to help students get acquainted with freshmen ROSES and non-ROSES peers, get involved in extracurricular activities, and generally adjust to college life. They live in Bailey hall, but serve a somewhat different role from regular residence hall assistants. They also serve as teaching assistants for the ROSES seminar instructors, and hold office hours in the residence hall. For their efforts, they are paid for 5 to 10 hours per week, and are guaranteed single rooms in the residence hall.

IV. Program Assessment

A number of assessments have been made of the ROSES program. In most cases, these have been focused on measuring students' perceived satisfaction with the program in the context of identifying improvements in the experience. A more recent assessment has attempted to compare the academic performance of ROSES students with non-ROSES students with similar course programs.

The most common and consistent assessment has been a program satisfaction survey given to students in the ROSES seminar class at the end of the first semester. It essentially seeks to measure whether the program is meeting its stated objectives in the opinion of the participants. The common survey statements used in this assessment are given in Table 2. Respondents are asked to rate their level of agreement or disagreement with these statements. Table 3 provides a five-year summary of the results, and Figure 1 provides a plot of these same results against time.

The trend of the responses for the five year period show a general increase in student satisfaction with the program across all questions, indicating that a quality improvement process is in taking place. The total number of positive responses is also high, indicating that the program is meeting its stated objectives.

The questions for which respondents consistently report the strongest agreement are number 10, indicating the instructional team's availability and willingness to help students, which has been consistently above 95 percent and attained 100 percent during the period; and number 9, the organization of the course, which climbed from 83 to 99 percent during the period. The item for which the greatest improvement has been observed is from question 6, "The class helped me prepare for the academic rigor of the curriculum." However, this is still one of the three items for which a positive response is among the lowest (at about 75 percent), along with number 8, participation in activities, and number 11, the effectiveness of homework.

Table 2
ROSES Assessment Questions

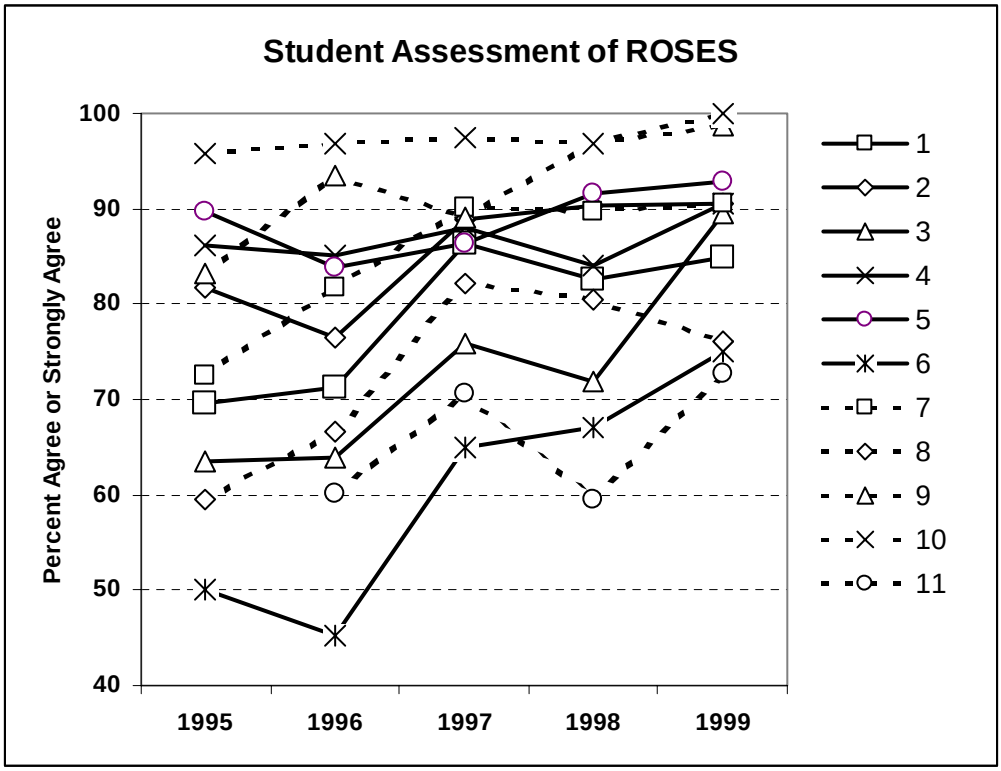
	Question
1	The class increased my motivation toward a career in engineering, science, or

	agriculture & natural resources.
2	I learned strategies and skills to promote my academic success.
3	The class enhanced my personal and professional development.
4	The class provided an orientation to my college, the University, and collegiate life.
5	The class increased my awareness and use of campus resources.
6	The class helped prepare me for the academic rigor of my curriculum.
7	I have developed linkages with other ROSES students.
8	I participated in activities that enhanced the relationship between my residence and academic lives.
9	The course was well organized.
10	The instructor/instructional team was available and willing to help students.
11.	Homework assignments enhanced my understanding of the material presented in class.

Table 3
Responses to ROSES Assessment Questions

		Percent of question respondents replying "agree" or "strongly agree" (number responding)				
Question		**1995**	**1996**	**1997**	**1998**	**1999**
1	Career motivation	69.6 (112)	71.3 (94)	86.3 (124)	82.5 (143)	84.8 (112)
2	Strategies and skills	81.7 (115)	76.6 (94)	88.8 (125)	90.3 (144)	90.5 (116)
3	Enhanced development	63.4 (112)	63.8 (94)	75.8 (124)	71.8 (142)	89.6 (115)
4	Orientation	86.2 (116)	85.1 (94)	88.0 (125)	84.0 (144)	90.6 (117)
5	Campus resources	89.7 (116)	83.9 (93)	86.3 (124)	91.6 (143)	92.9 (113)
6	Prepare for academic rigor	50.0 (114)	45.2 (93)	65.0 (123)	67.1 (143)	75.0 (112)
7	Linkages with students	72.4 (127)	81.7 (93)	90.2 (123)	89.8(137)	90.6 (117)
8	Activities	59.4 (138)	66.7 (87)	82.1 (123)	80.5 (149)	76.2 (109)
9	Course organization	83.2 (119)	93.5 (93)	89.0 (82)	96.8 (94)	98.7 (79)
10	Instructional team	95.8 (120)	96.8 (93)	97.6 (82)	96.8 (94)	100.0 (80)
11	Homework		60.2 (93)	70.7 (82)	59.6 (94)	72.7 (77)

Figure 1
Responses to ROSES Assessment Questions



Considering the objectives for which there were the most and least strong agreement, the message is somewhat consistent with the quote in the prologue of this paper. The freshman year can be overwhelming to students, and despite the fostering of student interaction, the immediate needs satisfied are those that can be and are satisfied by the instructional staff and seminar course—"tell us how to get through this." Having survived the start, the student interaction can and does continue to gel with time, with many of the former ROSES students continuing to live together in in succeeding years both on campus, in Bailey Hall and elsewhere, and in off-campus housing.

Assessments of the comparative success of ROSES and non-ROSES students have been less systematic than assessments of student perceptions. However, some very limited previous studies suggested both higher grades and better retention for those in the program. At the end of fall semester 2000, a study was made to compare class performance and retention of ROSES and non-ROSES engineering freshmen in three entering classes spanning a five-year period: fall semester '96, '98 and '00. To better ensure consistency of comparisons, the two data sets were trimmed to focus on students carrying similar and "traditional" schedules, taken as those simultaneously enrolled in Calculus I (MTH 132), Chemistry I (CEM 141), and any one of several Integrated Social Science courses (ISS 2xx). To balance instructor load across colleges, most engineering freshmen at MSU take their freshman writing course in the second semester. For each class and group, the following data were determined:

- Statistics (mean, median and standard deviation) on ACT composite score.
- Statistics on ACT mathematics score.
- Statistics on Predicted MSU GPA (a measure determined by the Admissions Office based on a variety of factors).
- Grade in CEM 141
- Grade in MTH 132
- Grade in ISS 2xx
- Cumulative GPA at end of fall 2000.
- Retention at end of fall 2000.

Results are summarized in Table 3.

Table 3
Comparative Performance and Retention of Engineering ROSES and non-ROSES students, Fall 2000
(mean values, with slight discrepancies due to rounding)

Class (N)	**96 ROSES (21)**	**96 non-ROSES (88)**	**diff.**	**98 ROSES (30)**	**98 non-ROSES (128)**	**diff**	**00 ROSES (24)**	**00 non-ROSES (122)**	**diff**
ACT composite	25.76	24.95	0.81	24.93	24.80	0.14	25.00	25.16	-0.16
ACT math	26.48	26.82	-0.34	27.63	27.38	0.26	27.58	27.62	-0.04
Predicted GPA	2.82	2.75	0.07	2.83	2.79	0.04	2.91	2.87	0.05
CEM 141	2.79	2.77	.01	3.00	2.93	0.07	3.48	3.07	***0.41***
MTH 132	2.81	2.70	0.10	2.30	2.78	***-0.48***	3.02	2.52	***0.50***
ISS 2xx	2.90	2.91	-0.01	2.92	2.98	-0.06	3.13	2.94	0.18
Cum. Credits	114.6	109.5	5.1	66.7	65.1	1.6	15.4	14.0	***1.35***
Cum. GPA	2.93	2.94	-0.01	3.03	2.91	.12	3.27	2.90	***0.37***
Retained in Engr	66.7%	67.0%	-0.3%	70%	81.3%	-11.3%			

Differences in boxed ***bold italics*** are significant at the 0.04 level.

For the subsets of students selected, those with a first-term schedule including a set of three common courses, no statistically significant difference in pre-college predicted academic capability was found to be present. The ACT scores and predicted MSU GPA variables were initially included because it was expected that some adjustment may have to be made for these variables due to the selectivity factor of the ROSES program. In fact, the differences in means were insignificant. However, the variances of these measures were greater for the non-ROSES students than for the ROSES students, who form a more consistent set.

For the 1996 ROSES freshmen, no statistically significant differences in freshman course

performance was noted, nor was there a significant difference in retention as measured by year 2000 cumulative credits or GPA was noted. The 1998 freshman class provided a surprising result; performance of ROSES students in MTH 132 (Calculus I) was worse by –0.48 and the difference is statistically significant ($p < 0.04$) when assessed by a t-test. On a possibly related note, this class has a lower retention rate by fall 2000 than non-ROSES students, 70 percent against 81.3 percent. A specific cause has not been identified.

By the fall of 2000 a notable turnaround had occurred, with the ROSES students doing statistically better in CEM 141 (+0.41), MTH 132(+0.50), cumulative credits (+1.35) and cumulative GPA (+0.37).

V. Discussion

Despite the ROSES program being in its eighth year, both the satisfaction surveys and the comparative performance surveys suggest trends toward accelerated success of the program in the last few years. What might be the factors? Recall that it was fall 1995 before small-course model was implemented, wherein groups of students and their ROSES seminar instructor had the opportunity to personally interact, and the model began to look like the current one. By 1998, the staff (both instructional and residential) had converged on what were realistic expectations for the program and the participants. In that time frame, the role of the student peer leaders had become much better defined. Considerably more attention was paid to the process of recruiting and selecting them and peer leader training was strengthened, working from existing materials used nationally for residence hall assistants. Who decides to be a peer leader, given the rather minimal compensation? Most all are former ROSES students who place some value on “giving back” to the program for one of two reasons—either someone’s help ahead of them motivated them to do the same, or the lack of help on someone’s part motivated them to make the program better.

In addition to the peer leaders’ efforts, more attention has been recently placed on steering the students into the common ROSES course sections. Although there are common sections with blocks of reserved seats, ROSES students are free to develop their own schedules at orientation. Again, the diversity of student situations at MSU (math placement level, athletes, band, extracurruiculars, etc.) precludes all students being in common classes as a homogeneous group. In the past few years, peer leaders have worked side-by-side with new freshman during computer enrollment, to guide them toward the ROSES sections to the extent possible.

Two groups have consistently demonstrated their interest in the ROSES program, women students and parents of prospective students. While the intent of the ROSES program is for its composition to mirror the student population, it has consistently attracted above-average numbers of women. With women comprising about 23 percent of engineering students at MSU (a few percent above the national average), the percentage of women in the ROSES program has been in the range 25 to 35 percent. The converse statistic may be more informative of the reason. The 17,878 undergraduate women at MSU in the Fall of 2000 made up nearly 54 percent of the undergraduate population, but only about 4.5 percent of them were engineering students. Rather than stating

women are underrepresented in engineering, a much stronger and telling statement may be that engineers are underrepresented among women. For a woman engineering student not in such a program, the opportunities to connect with other women with similar interests are much more limited.

Parents of prospective students comparing schools during the college admission process are particularly interested in the ROSES program, as well as other living-learning programs at Michigan State, notably RISE (Residential Initiative for Study of the Environment) a joint effort of five MSU colleges, and the Lyman Briggs School in the College of Natural Science previously mentioned. It is clear that parents have considerable concerns for a successful transition to college life, likely for the same reasons cited earlier in the prologue to this paper. However, some of the recent improvements found in the program assessment may be attributable to increased selectivity when admitting the more marginal students to the program. In the essay component, increased emphasis has been placed on selecting students based on their *own* perceived engagement in the program, not merely in their parents' desire to have them in the program.

VI. Summary and Conclusions

In summary, the ROSES program and the living-learning model has been viewed as a very positive and beneficial model for enhancing the transition to the intertwined academic and social aspects of college life. Lessons learned include

- The benefits of the small (25 students) sections of the ROSES seminar class, with advising professionals forming the instructional core, over the model of a single large section or a few large sections.

- The important role of the peer leaders and the need for careful recruiting and training thereof. It should be no surprise to those familiar with young adults that one's own peers can have a major role in the success or non-success of the college experience.

- The importance of ensuring that significant numbers of students in the program do in fact end up together in the common sections.

- The need for considerable structure and organization in the management of the program. Co-directors, seminar instructors, peer leaders, resident assistants and residence hall management working very closely together on integrated experiences have pushed the program to the level of excellence it currently enjoys.

- The need for proactive guidance of these students on the part of those above. Simply putting the students together, historically the first piece of the puzzle, will not in itself guarantee results.

VII. Acknowledgments

The existence of the ROSES program owes much to Dr. George VanDusen, who was the Assistant Dean of Engineering for Undergraduate Studies at MSU for more than 30 years and was a driving force in conceiving the program and making it a reality. The help of Ms. Wendy Booth, information technologist in the College of Engineering, was invaluable in writing the necessary queries to extract the data used herein and compiling it for our use.

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