AN EVALUATION OF A LEARNING COMMUNITY PROGRAM FOR FRESHMAN ENGINEERING STUDENTS

NADIYE O. ERDIL, Binghamton University
KOENRAAD E. GIESKES, Binghamton University

Abstract

This paper discusses a pilot program for a freshman engineering learning community at Binghamton University. The engineering learning community program is an integration of three courses, an introduction to engineering course, a technical writing course, and a calculus course, for students who reside in the same campus residence hall. The main objectives of the program are to improve student retention, to increase faculty/teaching assistants/student/residential staff interaction, and to encourage student engagement and interest.

This paper focuses on the Introduction to Engineering course portion of the program. In this paper, assessment tools, assignments, and examples of student work are described. Also an evaluation of the effectiveness of the methods used throughout the course is given; and the outcomes in terms of student retention, engagement, and learning are discussed. Another item addressed is the program's success in increasing instructional time and fostering greater ties between the faculty, teaching assistants, students, and residential components of college life.

The Introduction to Engineering course portion of the Learning Community was comprised of two sections, each consisting of twenty students. The paper includes a comparison of these two Learning Community sections with the traditional (non-learning community) sections in order to identify the potential benefits that the Learning Community environment provides. In addition, student-driven projects that were only carried out in the Learning Community sections are discussed.

Introduction

In an ever-changing world, the importance of engineering and technology continuously increases. However, compared to other disciplines, enrollment in undergraduate engineering degree programs in the U.S. shows no significant changes within the last two decades.[1] In an effort to increase interest in engineering fields, non-traditional approaches may help attract more students. As a starting point, increasing the motivation for existing engineering students may both increase student success and improve student retention. Moreover, it may create an appealing environment for future enrollees. Increasing motivation can be attained by encouraging student interest and engagement. A pilot program at Binghamton University, an Engineering Learning Community for freshman students, was developed as part of these efforts.

Learning Communities, as defined by Smith, Macgregor, Matthews, and Gabelnick[2], are "a variety of curricular approaches that intentionally link or cluster two or more courses, often around an interdisciplinary theme or problem, and enroll a common cohort of students". By creating the links between the courses, both through common enrollment and through common themes and pedagogy, they serve to reinforce the interdependence of the courses and create a strong sense of community among the students and the staff. When linking the residential life component with two or more courses meaning that the students are enrolled in the same classes and live within the same residential hall it further reinforces these connections. Residential Learning Communities also allow for an easier integration of course work with extra-curricular activities and create readily accessible sources of help through both the nearness of fellow students and through the faculty that often holds classes and office hours in the residential hall.[2] Increased student involvement, satisfaction and success as a result of increased interaction with faculty and peers, and involvement in academic and social activities beyond the classroom has been the topic of many studies.[3,4,5] Zhao and Kuh show that participating in learning communities results in the outcomes listed above.[6] Edwards and McKelfresh, further, demonstrate the positive impact of linking the residential life component.[7]

The Watson School of Engineering and Applied Science at Binghamton University features a common freshman year for all engineering students. Mechanical, electrical, computer, industrial, and bio-engineering students are enrolled in the same freshman engineering courses. During the first semester of their freshman year, all engineering students take an introduction to engineering course (WTSN 111: Exploring Engineering I), a Technical Writing course (WTSN 103: Technical Communication I), and a calculus course (MATH 221: Calculus I). Of these courses, WTSN 111 and WTSN 103 are linked courses consisting of a joint lecture that meets twice a week, and activity sections that each meet once a week (fourteen WTSN 111 laboratory sections and eleven WTSN 103 guided discussion sections). The joint lecture of the WTSN 111 and the guided discussion sections of WTSN 103 are taught by faculty members, while the WTSN 111 laboratory sections are taught by the teaching assistants. MATH 221, also taught by teaching assistants, consists of thirty separate discussion sections that each meet for four and a half hours a week. Since all of the students are required to take these three courses during the semester, and since, other than the WTSN 111/103 lecture, all course work was done in sections, the groundwork for a learning community was already in place.

The Mountainview Engineering Learning Community program is an integration of these three courses for students who reside in the same campus residence hall in the Mountainview Community – a new dormitory complex. The student members of the Learning Community all shared a common MATH 221 section and attended WTSN 111/103 joint lecture; but due to size limitations were split among two activity sections for both WTSN 111 and WTSN 103. This Learning Community is a pilot program, and the main objective is to assess whether such a format encourages student interest and engagement, increases student motivation and success, and improves student retention. Since the program has been conducted only one semester thus far, this paper, focusing on the Introduction to Engineering portion of the program, discusses the former issue, and leaves the assessment of student retention as future work.

The measure of student success used in this paper is the same as that defined by Zhao and Kuh, that is, "student engagement in educationally purposeful activities, self-reported gains in a variety of desired outcomes of college, and overall satisfaction with their college experience."[6] To depict the elements of student engagement, Zhao and Kuh use six scales of these we use four as our primary measures. These are: "(1) academic efforts, (2) higher-order thinking skills required in the course, (3) active and collaborative learning, and (4) interaction with faculty members."

In this paper, discussion of the learning community section assignments and examples of student work, comparison of the learning community sections with the traditional sections, reports of student evaluations, and authors' review of the learning community program are presented to assess the success of the learning community program. The authors were the teaching assistants of the WTSN 111 portion of the program.

We start with the projects and activities that are specific to the learning community sections. These include the Wagner Mill assignment, the mini-golf contest, combined office hours/scheduled lunches, social events, and a gala. Then, we move to the items that are common to all sections, and compare the outcomes for the learning community and the traditional sections. These items are the weekly WTSN 111 laboratories, the lab practical exam, and the Student Opinion Of Teaching surveys (SOOTs).

Activities Specific to the Learning Community Sections

The Wagner Mill Assignment

The Wagner Mill assignment consisted of three parts. The first part was conducted in the WTSN 111 laboratories during which the students were asked to use Solid Edge, a 3D CAD software package, to generate solid models and drawings of the components of a water-powered saw mill. The second part was the trip itself where the students had a chance to see a water mill in operation and had time to get measurements of its components. The final part was a team homework assignment for which the students were asked to use the solid model of the water mill component to solve a mathematical problem involving the operation of the water mill. The idea behind the Wagner Mill assignment was to provide students a tangible example of how and where the content covered in class could be applied outside of the classroom.

During the two weeks before the trip, in order to prepare the students for the homework assignment and to provide them with an example of how to gather data at the mill, the learning community WTSN 111 laboratory sections were given specially designed lab assignments. These assignments, while still covering the same material as was being asked in the traditional sections, were completely dedicated to solid models and drawings of a water mill. In the first class, the students were split up into five teams of four people. Each group was assigned a particular component of a water mill, e.g., the support, the wheel, the bucket, etc., and asked to generate a solid model of these components with dimensions that were provided. The second week, all groups were asked to create technical drawings of their assigned components. During the week following the trip, the students were asked to combine all the separate parts of the mill into an assembly of the water mill.

The trip to the Wagner Mill took place on a Saturday morning and consisted of students, teaching assistants, faculty, as well as a number of the residential life staff. The Wagner Mill is a local lumber mill where they have both a water-powered up-and-down saw as well as a diesel powered circular saw. At the mill, the students received demonstrations of both saws. They, also, received their respective team assignments. Each assignment consisted of three parts, an essay, sketches and drawings, and a mathematical calculation. While the essay was the same for all groups, the remaining two parts of the assignment were not, and pertained to the specific portion of the mill that the group had been made familiar with during the two labs prior to the trip. While at the mill, the students were required to make sketches and take measurements of their assigned section, which could then be used at a later time to create technical drawings and to carry out their calculations. They were allowed plenty of time to work on the portion of the team homework assignment that required data collection at the mill.

The Wagner Mill trip was an excellent hands-on experience for the students. It allowed them to apply in a real environment what they had previously done only in the classroom environment. When the students were split into their teams, because of their shared classes and housing, they all knew each other's strengths and weaknesses as well as their likes and dislikes. This allowed them to work very well as a team, not just in rapid task delegation, but also as soon as one member was struggling with a certain task another was there to help them with it. Also, through the comparison of the earlier style of the water-powered up-and-down saw to the much faster and more accurate diesel powered circular saw, the students could see firsthand how much of an effect engineering design has on people's livelihood. After the trip, the students were asked to do a free write on this trip, and their responses showed that the trip had achieved its purpose. They all commented on how beneficial it was to be able to apply their classroom knowledge to a real life problem. Overall, we believe that such a simple trip and the assignment associated with it brought student closer to their disciplines and provided an atmosphere to nurture their curiosity and interest.

Figure 1. Students at the Wagner Mill

Mini-Golf Contest

The second activity that was specific to the learning community sections was the design of a portable miniature golf course. This activity turned out to be the most popular and the biggest activity. It was designed to be a contest, involving people with different disciplines as resources to the students, and included a recognition ceremony at the end of the project that brought a variety of school officials together to recognize the students' efforts.

The mini-golf course project came about in one of the learning community weekly staff meetings that included the faculty, teaching assistants, the program administrators, and the residential life staff. While brainstorming on developing a project that would be both creative for students and applicable in real life, the residential assistants suggested that a miniature golf course for use in the Mountainview Community would be utilized by the residents if it were portable. Having students work on the design of a portable miniature golf course seemed like an excellent application for our purpose, and a fully formed project plan was developed. The project was divided into two stages. The first stage was to design a portable base upon which the holes would be built, and the second stage was the actual design of the obstacles on the golf course. Since the golf course was to be fabricated on campus, it was decided that one semester was not enough time to complete the whole project. Therefore, the project would span the entire year, with the first semester being dedicated to the design of the base structure, and the second semester used to build the bases and design and build the obstacles. A contest would be held for both stages; for stage one only one design would be the winner, and that would be the base that would be built (nine of these bases would be fabricated); and, for stage two, nine designs would be selected as the winners. The miniature golf course was designed to be a nine hole golf course.

Once all the details had been worked out, the project was presented to the students. Since the project was introduced nearly halfway into the first semester, it was felt that the students should have a say in whether they were willing to add a second major project to their schedules. After the scope and goals of the project had been explained to them, the vote was unanimous in favor of adding the project. The WTSN 111/103 course already included a semester-long team reverse engineering project, involving improvements to the item for added functionality. This project was to be completed by the students in teams, and the teams were already formed. For the mini-golf project, new teams were not formed since the students agreed that working with the same reverse engineering team would be convenient and easier.

After the specifications of the project were explained, the students were notified that help would be provided in the form of design reviews by faculty from the engineering departments, a group of in-house engineers working for the university, and the mechanical workshop technicians. Throughout the course of the project, several design reviews were scheduled and students presented their designs and heard a wide range of reviews from these people. Upon completion of the project, one of the student designs was chosen by these same in-house engineers and technicians. This winning design would then be used to build nine fairways.

As was mentioned above, this project turned out to be a popular and big activity. This was because the students were incredibly passionate about their designs; and since it was a contest they all enjoyed the competition. During the design reviews, the students very enthusiastically described their designs to the reviewers and carefully considered any criticism or suggestion that was offered. In the end, they all had unique and creative and different designs; each team's design used different materials, different construction methods, a different type of portability, etc. Upon completion of the project, the students had not only learned much about the design process but through the interaction with the in-house engineers, they also learned a lot about what some of their future jobs might entail. As teaching assistants, it was rewarding for us to see their excitement in this project, especially knowing that this was extra work for them. Little additions such as finding a theme that would be of interest to them all, golf in this case, making it a competition, providing help from people in engineering practice, and promising a recognition ceremony, encouraged student engagement and interest.

Combined office hours/scheduled lunches

The combining of faculty office hours and scheduled lunches are other methods that were tried with the learning community sections. There were seven teaching assistants for the WTSN 111 portion of the class. All teaching assistants were required to hold two hours of office hours per week. These office hours were not dedicated to a particular section; rather any WTSN 111 student could attend the office hours of any teaching assistant. The addition to the learning community portion of the program was that an hour of the learning community teaching assistants' office hours was to be held in the learning community student residence hall. In addition, this was a combined office hour with the WTSN 103 and the MATH 221 instructors; that is, faculty and the teaching assistants for all three courses held their office hours at the same time and in the same room. Moreover, the hour before the scheduled office hour was a weekly lunch gathering for the faculty and the teaching assistants at the dining hall of the learning community students' residence hall.

In general, the perception is that freshman students do not utilize faculty and teaching assistant office hours, which is supported by the rates of office hour attendance given on previous student evaluation forms. However, the scheduled lunches and the combined office hours for the learning community students never suffered from lack of attendance. This arrangement turned out to be effective in terms of student participation and engagement. The students seemed to enjoy spending time with the faculty and the teaching assistants outside class time. Both, the lunches and the office hours were informal, where students were not limited to course-related topics only. Some of the topics that came up during the lunches were the students' curriculum, their future career plans, questions about the different engineering disciplines, or just plain daily conversations. Providing time for students in an informal environment to talk about such topics in a stress-free manner encouraged them to think and discuss their purpose in college and what they would like to accomplish. Also, it kept them connected with the course and the faculty and the teaching assistants.

The office hours, though they were in a similar informal fashion, were geared more towards the course. The format of the office hours, having the faculty and the teaching assistants of the three courses in one place, offered a convenient environment for the students to have access to multiple resources. Considering that WTSN 111 and WTSN 103 are closely linked in the reverse engineering project, being able to work on this project where instructors from both classes were present boosted their interest in the project. There were times when students showed up for office hours with their teammates just to work on their project even though they did not have any questions for the instructors. The place chosen for the office hours was also a factor since it was a big study room with comfortable chairs and large tables.

At the end of the semester, we saw that little variations from the traditional settings of office hours, coupled with the scheduled lunches made a big difference in student participation and engagement. When students see that their professors and teaching assistants are willing to accommodate their needs when possible, such as holding office hours in their residence hall, their interest in the course increases.

Social events

Other activities that were specific to the learning community sections were the social events arranged throughout the semester. The two main activities were the ice cream social and the "book and a movie" social. The groundwork for the book and a movie social was begun well before the beginning of the academic year. During the summer before the first semester, all the students, as well as the faculty, were asked to read *Do Androids Dream of Electric Sheep?*[8] by Phillip K. Dick. Then, during the third week of the semester an evening event was arranged that started with a showing of the movie *Blade Runner*[9], the storyline of which was inspired by the book. After the movie, a discussion comparing the merits of both the book and the movie took place. In order to create an atmosphere in which the students felt free to share their opinions the discussion was carried out in as informal a manner as possible. In addition, mid-semester, an ice cream social was held in the same format.

These activities were done in order to encourage social interaction, not just with fellow students, but also with the faculty and residential life staff. By placing the students and faculty together in an informal setting, and by encouraging conversations outside of the realm of class work and assignments, they allowed the students to see the faculty in a much less intimidating manner. When the faculty is no longer seen as a distant unapproachable figure, but rather someone with whom the students share some interests and world views it becomes much easier for the students to share any issues or problems they are having in or outside of class or to bring up a topic they are interested in pursuing.

The Gala

During the final week of the semester, a gala was scheduled during which the learning community students present their semester work. Invitations to the gala were sent to members from all aspects of university life. Along with all the people directly involved with the learning community, some of the others that attended the gala included: the Provost, the Dean of the Watson School and the department chairs, assorted engineering faculty as well as the in-house engineers that helped with the miniature golf project, the owners of the Wagner Mill, and the student advising staff.

For the gala, each group was asked to present on one of the three major portions of their semester's work: (1) the learning community events, including the trip to the Wagner Mill, (2) the reverse engineering project, or (3) the miniature golf project. The student groups were at tables situated along the walls of the room and were told to prepare presentations that could be presented to an audience that was encouraged to visit all the tables. In preparation of this event, the students had practiced the presentations the week beforehand. Also, they were trained by the undergraduate course assistants of the technical communications course on presentation techniques earlier in the semester.

The Gala event, turned out to be a great success, both in terms of the student work and as an experience for the students in presenting to an audience that is not comprised solely of their classmates. Throughout the event, all the student groups had an almost constant flow of people stopping to listen and learn about the project they were presenting.

Overall, these activities, ranging from the Wagner Mill Assignments to the Gala, that were specific to the learning community helped to foster greater ties between the faculty, teaching assistants, students, and residential components of college life. Within the learning community sections, we observed that the students' transition to college life had been smoother compared to the traditional sections. In addition, the learning community students exhibited a greater engagement and interest in the course despite their heavier workload with extra projects.

Activities Common to all Sections

To this point, we described the activities specific to the learning community sections and discussed the outcomes observed for the learning community students. Now, we move on to the items that are common to all sections and compare the outcomes in the learning community to the traditional sections. The common items are the weekly WTSN 111 laboratories, the lab practical exam, and the student opinion of teaching surveys (SOOTs).

WTSN 111 Laboratories

The WTSN 111 laboratories consisted of twelve in-class sessions scheduled weekly throughout the semester. There were fourteen sections of each session. Two of these sections were the learning community sections and the remaining were the traditional ones. The laboratory assignments were individual work, but students were always encouraged to work together during class time. The sections were conducted entirely by the teaching assistants; the authors of this paper taught the learning community sections as well as traditional sections.

The WTSN 111 laboratory assignments were given at the beginning of the laboratory period and students were given until the end of the session to complete it. The assignments were divided into the following skill categories: software training, experimental methods, free-hand sketching, and engineering solid modeling and drawing. In the first category, students were trained on MS Word, MS Excel and MS PowerPoint; the second category consisted of two sessions involving a tensile test and a digital circuit. The third category was one session, in which the students were guided to work on a hand drawing using pencil and drawing paper. The final category was dedicated to Solid Edge, which is a computer-aided modeling program.

To prepare weekly assignments, first a template was developed. Then, fourteen different assignments were created based on this template. Ascertaining consistency in the level of difficulty was always intended but not reached at all times. Throughout the semester, the more challenging assignments were always given to the learning community sections. The engineering modeling and drawing category, which consisted of three sessions, was the only category in which the learning community assignments used a different assignment template. These are the series of laboratory assignments explained in the Wagner Mill Assignment section of this paper.

In addition to the slightly different program of study in the WTSN 111 course, there were several other differences between the learning community and the traditional sections that influenced student behavior in laboratories. These differences were (1) the learning community students attended the same WTSN 111 and WTSN 103 sections, while the traditional section students were more than likely to have had separate classmates in these two classes, (2) the learning community students resided in the same campus residence hall, and (3) the learning community students spent more time with the faculty and the teaching assistants as a consequence of scheduled lunches and office hours conducted in their residence hall.

The design of the learning community program was a factor in assisting students to overcome the problem of isolation in a three hundred student class. Our observations in the WTSN 111 laboratory activities support this argument. As mentioned before, students were encouraged to work together on laboratory assignments. In the learning community sections, student collaboration was already present starting from the first class. On the other hand, with the traditional sections, we were not able to achieve the desired collaboration level even at the end of the semester. Knowing each other, spending time together, both social and educational, and being familiar with the faculty and the teaching assistants allowed the learning community students to engage in the class and also to be comfortable in the classroom. Asking for help from the instructors or the classmates, or expressing their opinions out loud seemed not to be a source of stress for the learning community students; on the contrary, they seemed to enjoy being interactive in and outside the class.

Our observation of student behavior for those participating in this program showed us that providing students an environment in which they can interact outside class time, in this case in their residence hall, and as teaching assistants spending time with them in their environment increased student motivation and encouraged student interest and engagement. We also saw the influence of these factors on student grades. In addition to the semester laboratory grade average, the class averages of individual laboratory assignments were 1 to 5 points higher in the learning community sections for almost all assignments. The assignments were graded out of 50 points.

The lab practical exam

Another criterion that we used to compare the learning community sections and traditional sections is the lab practical exam. There were three exams given throughout the semester in WTSN 111: one mid-term exam, one lab practical exam, and a final exam. The mid-term and the final exam included true/false, multiple-choice, matching questions, engineering problems, and essay (short-answer paragraph) questions. These two exams were given during the lecture hours to all students simultaneously. The lab practical exam (LPE), on the other hand, was held in the student laboratory sections; and each section took the exam during their scheduled laboratory hours. The LPE addressed materials covered in laboratory sessions. Since the mid-term and the final exam included the material covered in the lectures for all students and did not vary based on a section, the LPE is a better indicator of differences between the learning community sections and the traditional sections. Hence, in this paper, we focus only on the LPE.

The LPE consisted of three problems which were similar to those presented in the laboratory assignments that the students worked on throughout the semester. The problems were based on the software taught in laboratory sessions, and involved the skills that it is hoped the students acquired. The exam was a closed-book, closed-notes exam, however, the use of help files available in software programs was allowed.

The format and the assignments of the learning community laboratory sections as opposed to traditional sections and the observed outcome of these differences were discussed in the previous section. Based on these observations, it is expected that the learning community students would outperform the traditional sections in the LPEs. Our qualitative and quantitative results support this expectation. The three problems on the LPE were divided as follows: one MS Word, one MS Excel and one Solid Edge problem. For all students, while the difficulty level of the latter two was similar, the MS Word problem was designed to be easier relative to the others. Observing students during their LPE exams, we recorded the following: (1) the Solid Edge problem was the most challenging question for the traditional section students; students in these sections spent the most amount of time on this question. The learning community students, on the other hand, did not show a significant difference in terms of time spent on the Solid Edge problem versus the MS Excel problem. All sections showed similar patterns while working on the MS Word problem, (2) the majority of the students in the learning community sections finished the exam earlier compared to the students in the traditional sections, and (3) students in the learning community sections looked more relaxed during the exam, and seemed to be more comfortable using the software programs (i.e., using the help files, shortcuts, etc.).

These observations tell us that, when students are more involved in the activities and engaged in classes, the outcomes in terms of learning and success increase. Our observation on the Solid Edge question is one indicator of this. The learning community students had the opportunity to use their knowledge of Solid Edge to work on a real life problem, which we believe helped them grasp the concepts better than the traditional section students. Our quantitative analysis of the LPE grades supports our qualitative inferences. The one tailed t-test statistics with an α=0.05 indicates that the differences between the LPE averages of the learning community sections and the traditional sections is greater than four points. Since four points or higher is a one letter grade up, we consider this difference significant. As a side note, to ascertain consistency, all exams, including the LPE, were graded at a common, extended grading session including all teaching assistants and the faculty.

The SOOTs

Until now, we presented our assessment of the learning community program and compared it to the traditional sections. At the end of the semester all WTSN 111 students completed the student opinion of teaching surveys (SOOTs), which allowed us to see the students' perspective of the methods we had utilized in both sections, and what they think they gained from this course. Tables 1 and 2 summarize the results. Although each question had a four category scale with different scale in wording (such as: "to little extent", "to some extent", "very clearly", "generally clearly", etc.) to make the tables simpler, we use a four category (excellent, good, fair, poor) scale for all.

Table 1 concentrates on the general topics questions from the SOOTS. In all categories, the sum of excellent and good scales is always greater for the learning community sections. While 75% of the learning community students were satisfied with the course, only 60.5% of the traditional section students said that they were satisfied. The contribution of the assignments and the exams to their learning were highly rated by the learning community students (81.3% and 68.8%); however, the traditional section students did not think that the assignments and the exams contributed to their overall learning as much (57.9% and 55.2%). The attendance rates given by the learning community students (96.9%) as opposed to the traditional sections (92.2%) validated our observations on increased engagement and interest in classes among the learning community students.

SECTION	RATE	**How clearly were the objectives of the course defined?**	**To what extent did assignments contribute to your overall learning in the course?**	**How well did the exam(s) measure how much you learned in the course?**	**How well were the course objectives achieved?**	**How satisfied were you with this course?**	**How regularly have you attended this class?**
Learning Community Sections	Excellent	46.9%	50.0%	25.0%	34.4%	37.5%	87.5%
	Good	40.6%	31.3%	43.8%	40.6%	37.5%	9.4%
	Fair	9.4%	12.5%	28.1%	25.0%	18.8%	0.0%
	Poor	3.1%	6.3%	3.1%	0.0%	6.3%	3.1%
Traditional Sections	Excellent	25.8%	18.6%	13.7%	18.6%	18.7%	77.9%
	Good	44.5%	39.3%	41.5%	50.8%	41.8%	14.4%
	Fair	24.2%	31.1%	32.2%	26.8%	29.1%	5.0%
	Poor	5.5%	10.9%	12.6%	3.8%	10.4%	2.8%

Table 1 The results of SOOTs - general topics

Table 2 shows the student ratings on teaching methods and teaching assistant ratings. Similar to the results given in Table 1, in all categories we see that the learning community students were satisfied with the teaching methods and their teaching assistants more than the traditional sections. We believe that these results are consequences of all the activities and methods utilized in the learning community sections which were discussed throughout this paper.

SECTION	RATE	How effective were the instructional methods?	To what extent did the instructor make the subject matter interesting and thought provoking?	To what extent did the instructor encourage you to think critically about the subject matter of the course?	To what extent did the instructor care about whether or not you were learning in the course?	How available was the instructor for course-related assistance?	How much did you learn about the subject matter of this course?
Learning Community Sections	Excellent	37.5%	31.3%	31.3%	43.8%	65.6%	43.8%
	Good	43.8%	37.5%	31.3%	37.5%	18.8%	31.3%
	Fair	12.5%	25.0%	34.4%	18.8%	15.6%	21.9%
	Poor	6.3%	6.3%	3.1%	0.0%	0.0%	3.1%
Traditional Sections	Excellent	18.6%	8.2%	13.7%	14.2%	24.0%	25.8%
	Good	42.6%	26.2%	31.1%	29.0%	39.9%	37.4%
	Fair	31.1%	44.3%	37.7%	41.0%	26.8%	31.9%
	Poor	7.7%	21.3%	17.5%	15.8%	9.3%	4.9%

Table 2 The results of SOOTs - teaching methods and instructor ratings

Conclusion

In this paper we focused on the impact that a pilot program for an Engineering Learning Community at Binghamton University had on the interest and engagement of freshman engineering students. Through the combination of an introduction to engineering course, a technical communications course, a calculus course, and a shared residential hall, as well as assignments and events that were created specifically for this program, we were able to successfully promote student interest and engagement.

Throughout the semester the students were presented a number of projects and activities that were specific to the learning community, including the Wagner Mill assignment, the mini-golf contest, combined office hours/scheduled lunches, the social events, and the gala. Discussions and evaluation of these projects and activities showed that the experience in the learning community helped students become more confident in their chosen career path and has encouraged their interest in and engagement with the engineering major.

When considering the activities that were common to all freshman engineering students, such as the WTSN 111 Laboratories, the Lab Practical Exam, and the SOOTs, the learning community students showed a marked improvement in interest, engagement, and execution. This was also evident in the grades of weekly laboratories and those of the lab practical exam. Another evident difference was through the student attitude towards the course: while the learning community students were relaxed and comfortable in their classes right from the start, the traditional sections were not able to attain the desired level of comfort. This was again supported by the SOOT forms (Table 2), in which the learning community sections rated methods more favorably than did the traditional students.

In the beginning, our goal was to find methods to increase interest in the engineering fields in order to increase both enrollment and student retention. We feel that the pilot program for the Engineering Learning Community for freshman students at Binghamton University accomplished the first goal that had been set forth, through the increased interest and engagement in hopes of promoting student motivation. We will continue research to determine the effect of learning communities on retention in engineering.

Acknowledgments

The authors of this paper are very grateful to Matt Laferty and Dr. Roy McGrann for their invaluable comments and suggestions to the improvement of the paper. The authors also thank Stephen Duarte for his help.

References

1. National Science Foundation. "Science and Engineering Degrees: 1966-2004". Available online at http://www.nsf.gov/statistics/nsf07307/content.cfm?pub_id=3634&id=2. Last accessed on Feb 5, 2008.
2. Smith, B. L., MacGregor, J., Matthews, R., Gabelnick, F. *Learning Communities: Reforming Undergraduate Education*. San Francisco : Jossey-Bass, 2004 p119.
3. Pascarelle E.T., Terenzini, P.T., and Blimling, G.S. *The Impact of Residential Life on Students*. In C. Schroeder & P. Mable (Eds.), Realizing the educational potential of residence halls San Francisco: Jossey Bass, 1994 p22-52.
4. Tinto V. *Colleges as Communities: Taking Research on Student Persistence Seriously*. Review of Higher Education, v21 n2 p167-177 Win 1998
5. Pike, G.R. The *Effects of Residential learning Communities and Traditional Living Arrangements on Educational Gains During the First Year of College*. Journal of College Development, v40 n3 p269-284, May-Jun 1999
6. Zhao C.M., Kuh G.D. *Adding Value: Learning Communities and Student Engagement.* Research in Higher Education. v45 n2 p115-138 Mar 2004
7. Edwards K.E., McKelfresh D.A., *The Impact of a Living Learning Center on Students' Academic Success and Persistence.* Journal of College Student Development. v43 n3 p395-402 May-Jun 2002
8. Dick, Phillip k. *Do Androids Dream of Electric Sheep?* New York : Del Rey Books, 1968.
9. Scott, Ridley. *Blade Runner.* Warner Bros., 1982.

Biographies

Nadiye O. Erdil, (B.S., Computer Science – M.S., Industrial Engineering) is a Ph.D. candidate in System Science at Binghamton University. She has been a teaching assistant for over four years in the Engineering Design Division Department which directs the program for freshman engineering students.

Koenraad E. Gieskes is a Mechanical Engineering graduate student from Binghamton University. For the past four years he has been a teaching assistant for the Introduction to Engineering course.