Enhancing Academic Success through a Freshman Year Engineering Living-Learning Community

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Abstract - The number of students enrolled in engineering degree programs in the United Arab Emirates (UAE) has risen 38% in just three years, a positive response to national calls to develop an “elite corps of scientists, engineers and technicians.” This rapid increase in enrollment has led to demographic changes in the recent cohorts of entering engineering students, with larger numbers beginning their studies underprepared in the areas of mathematics, sciences, and the academic skills needed to succeed in engineering studies. The Petroleum Institute, a leading technical university in the UAE, has responded by developing a freshman year experience that integrates academic affairs, residential life, and student affairs. The overall aims of this initiative are to provide a comprehensive process that addresses the intellectual, social, and emotional growth and development of our students. Instructors, peers, advisors, staff and faculty all play a role in promoting enhancement of the skills and attitudes necessary for the attainment of academic, career and life goals, including the competencies needed for success in academic coursework. Following the fall 2013 semester, an extensive assessment of the impacts of this program on student engagement and development was conducted using a mixed methods approach that included student surveys, analysis of reflective writing and statistics on use of student support services and academic performance. This paper reports on the findings of this assessment, highlighting strengths and discussing suggested areas of improvement, suggestions that will enable this, and similar, freshman year experience initiatives to develop engineering undergraduates who possess the required competencies to contribute to a knowledge-based society.

Index Terms - First Year Experience, living-learning community, Middle East.

INTRODUCTION
In the past three years, the United Arab Emirates has witnessed a 38% increase in the number of students enrolled in engineering degree programs, a positive response to national calls to develop an “elite corps of scientists, engineers, and technicians” [1]. The need for locally-born engineers within the oil and gas industry, and in particular the Abu Dhabi National Oil Company (ADNOC) is especially critical. The Petroleum Institute (PI) is a leading engineering university located in Abu Dhabi in the United Arab Emirates. Established in 2000 by Emiri decree and enrolling its first students in 2001, the PI educates engineers who primarily go on to work for ADNOC and its operating companies. The push for locally-born engineers, known as Emiratization, has seen a large increase in the number of entering engineering students to the PI. This rapid increase in enrollment includes demographic changes in recent cohorts of entering engineering students, with larger numbers beginning their studies underprepared in the areas of mathematics, sciences, and the academic skills needed to succeed in engineering studies. In response, the PI has developed a unique Petroleum Institute Freshman Year Experience (PI FYE) that integrates academic affairs, resident life, and student affairs in order to provide freshman students the resources and support they need to make a smooth transition into the new rigors, requirements, and expectations of university. The overall aims of the PI FYE initiative are to provide a comprehensive process that addresses the intellectual, social, and emotional growth and development of our students. PI FYE provides a variety of program components and resources to help freshmen adjust to college-level coursework and foster connections with fellow students, faculty, and support services that will sustain them throughout their education. In this paper we will describe the various programs and present and discuss findings regarding the impacts of the program to date. We will conclude with recommendations and next steps.

LIVING-LEARNING COMMUNITIES
Research indicates that faculty-student interaction and peer academic interaction are especially important to student success, and that learning communities appear to be particularly effective in nurturing deeper student learning and in creating a sense of community among teachers and students [2]-[7]. Studies also suggest that residence-based programs are more effective than other learning communities in achieving desired student outcomes [8]-[10]. In a study on living-learning communities (LLCs), Shushok and Sriram [11] showed that students in a LLC were 7.4 times more likely than non-LLC students to meet informally or socially with a faculty member outside of class or faculty office hours. LLC students were also 2.5 times more likely to meet in an organized study group or with a faculty member outside of class or faculty office hours. Shushok and Sriram [11] identified three characteristics of successful living-learning programs (LLPs): (1) to have a strong student
affairs-academic affairs presence and partnership, (2) to identify clear learning objectives with a strong academic focus throughout the program, and (3) to capitalize on community settings to create opportunities for learning wherever and whenever they occur. With the above findings as a foundation, the PI brought together representatives from Academic Affairs, Student-Affairs, Residential Life and academic faculty to develop a living/learning freshman year experience to enhance the academic success of its new students.

**Program Description**

The Freshman Year Experience at the Petroleum Institute is a campus-wide collaboration intended to provide freshman students with the resources and support needed to make a smooth transition from high school to the rigors, requirements, and expectations of university. The PI FYE program has a variety of components and resources available to help freshmen adjust to college-level coursework, and to help them discover the academic, social, and personal balance that leads to graduation. The program enables freshman to make connections with peers, their faculty, members of staff and administration. The PI FYE Program also encourages its students to determine their own educational and professional goals, while focusing on what it means to be responsible to themselves, to the PI, ADNOC, and to their local, regional, and global communities.

Faculty, staff, and students of the Petroleum Institute take mutual responsibility for providing a Freshman Year Experience that fosters effective learning. The entire University is committed to providing an atmosphere that enables freshmen to adapt to the academic rigors of college life, transitions them into our academic community, respects the diversity of ideas, builds a foundation for future success, and fosters lifelong learning. The program enables freshman to make connections with peers, their faculty, members of staff and administration. The PI FYE Program also encourages its students to determine their own educational and professional goals, while focusing on what it means to be responsible to themselves, to the PI, ADNOC, and to their local, regional, and global communities.

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- **Goal One:** To connect students to resources that promote belonging, wellness, and success in the first year.
- **Goal Two:** To inspire intellectual curiosity in and introduce students to the richness and rigor of a Petroleum Institute education.
- **Goal Three:** To develop skills essential to academic success and lifelong learning.
- **Goal Four:** To promote engaged living and learning and to explore commitments to campus, ADNOC, local, regional, and global communities.

Figure 1 illustrates the three main components of PI FYE which are Skills, Success, and Socialize, each within its own circle, and how the three components intersect each other in the form of PI Connect, ENGR 101, and CAMP PI. Students are expected to participate in a variety of workshops, meet with advisors/counselors, use tutorials and/or the library, and participate in extra-curricular activities and community service.

The tangible link among the various components is the FYE Involvement Activities Passport. The passport is a tool used to encourage and track student participation across the Skills, Success and Socialize components, and is reinforced through inclusion as part of the assessment in ENGR 101, the freshmen engineering success seminar. For each activity a student participates in, they receive a passport stamp, with each stamp counting towards 1% of their ENGR 101 final grade, up to a maximum of 15%. An example of a student passport is shown in Figure 2.

Overall, the Freshman Year Experience begins by placing students into cohorts.

## I. PI Connect Living-Learning Cohorts

At the beginning of their first semester, freshman students are grouped into cohorts. A cohort of approximately 20 students is enrolled in the same sections of their mathematics, chemistry, engineering seminar, and communication courses.
The cohort members resident on campus, approximately 80%, are also assigned to live on the same floor of the dormitory and assigned a Residence Assistant (RA), completing the foundation of the living/learning community. Students help each other in many ways, such as ensuring none of their cohort members oversleeps and encouraging one another in their studies. The RAs provide mentorship, organize activities, and regularly communicate successes and concerns with residential life and student affairs. Each cohort is also assigned their own faculty advisor whose responsibility is to support the students academically and promote participation across the three components.

II. Skills

The overarching goal of the Skills component of the PI FYE is to provide students with targeted workshops that enhance their personal and academic growth. While many of the courses offered in freshman year have behavioral skills already infused, it was recognized that development of key skills recognized as integral to university adjustment needed to be explicitly addressed in forums outside of the formal classroom setting. Workshops targeting skills such as university adjustment, setting academic and personal goals, time management, communicating with instructors, team building, and test anxiety are hosted weekly by the Independent Learning Center (ILC). In addition, provision is made to allow students to develop professional skills through workshops on Leadership, Entrepreneurship, Public Speaking and Team Building. Students may decide to attend these workshops and talk on their own or may be encouraged to attend by their advisor, counselor, and/or instructor. They receive one passport stamp for each workshop attended, up to a maximum of four stamps in a semester to be counted toward their ENGR 101 grade.

III. Success

The ‘Success’ component of PI FYE is designed to encourage students to engage in activities that have been demonstrated to be key components of academic persistence, including meeting with advisors/counselors and utilizing learning resources such as the library, tutorial centers and the Independent Learning Centers. This strand brings together academic advisors, student counselors, peer mentors, student support services and faculty. Each student in the PI FYE program is assigned an Arts & Sciences faculty advisor and a counselor. The advisors, who are responsible for all students in a particular cohort, keep in contact with their advisees and their advisee’s instructors, monitoring the academic progress of students and providing assistance and guidance when needed. Students are encouraged to meet regularly with their advisor, receiving up to three passport stamps, one for each substantial meeting during the semester. The Success component also includes promoting use of the learning resources that are available on campus, including tutorial centers, the library and the Independent Learning Center. The primary goal is to encourage students to develop the habit of visiting and using these resources.

IV. Socialize

The aim of the Socialize component is to connect students to the wider PI community through participation in various social activities. One important goal of participating in these social activities is to help students establish interpersonal relationships with other PI students, faculty, staff, and administrators. Another important goal is to build upon leadership and team work skills introduced in other areas of PI FYE. To this end, PI athletic, recreational and residential life programs organize and facilitate numerous activities throughout the academic year. The campus recreation department supports more than 12 PI clubs to provide students with the opportunity to participate in activities that meet their particular interest and help them to develop lasting friendships. Finally, community service events are also organized by students to contribute to the wider community. As with the other two components, participation is encouraged through passport stamps.

V. ENGR 101

ENGR101 is the Freshman Engineering Success Seminar, a required course that serves as an introduction to university studies, engineering and the oil and gas industry. By the end of the course, students will be able to confidently select their major area of study at the PI. The course includes a brief history of the oil and gas industry and moves through how oil and gas are discovered, produced, transported, refined, and marketed. At the same time, the course facilitates the development of appropriate skills, behaviors, and attitudes as they relate to the following areas: (1) orientation to university academics and life at the PI; (2) community building; (3) professional development; (4) academic development; and (5) personal development. As part of the course, each student is given a PI FYE passport, which becomes a component of ENGR101 assessment. Comprising 15% of the overall course grade, the passport motivates students to participate in a variety of activities available under the Skills, Success and Socialize focal areas of PI FYE. To earn all 15% of the PI FYE passport grade, students are expected to (i) attend at least 4 Skills workshops (1 stamp each), (ii) have at least three meetings with their advisor or counselor (3 Success Stamps) and to use the library and/or ILC, including any of the tutoring centers, for two hours a week for three consecutive weeks (1 Success stamp for each three weeks – three times during the semester – up to 3 stamps), and (iii) participate in three PI extra-curricular activities (1 Social stamp each), and contribute to one community service activity (2 Social stamps).

VI. CAMPP1

The final strand of the PI FYE program is CAMP PI (Chemistry, Arts, Math, and Physics), subjects which make up the large majority of the freshman year (core) courses. These courses are designed to be informative, stimulating and challenging yet supportive, engaging, and enjoyable. Skills learned in ENGR 101 and through participation in skills workshops are reinforced in CAMP courses. All four CAMP
subject areas offer outside-of-class activities for students to participate in such as special chemistry lab activities, math competitions, and special subject related seminars.

**MONITORING IMPACTS**

The ultimate success of the program can only reliably be assessed when students have completed their core courses, entered fully into their chosen degree program, and graduated. However, it is also important to document the initial impacts of the PI FYE program in terms of promoting the type of behaviors that have been shown to be connected with student persistence and achievement. In doing so, Hardie’s distinction between monitoring and evaluation is helpful [13]. He argues that “monitoring offers an answer to the question ‘How are we getting on?’ The process of evaluation, on the other hand “offers an answer to the question ‘How did we get on?’” This is a crucial stage and one which will determine how well the PI FYE program will perform in the next ‘cycle’.

In this paper we focus on the monitoring of our program, with evaluation, as per Hardie’s distinction, to occur in subsequent years.

The central foci of the PI FYE program are engagement, development, and promotion of positive relationships. Information regarding the impacts of PI FYE in these areas is obtained from two main areas: 1) qualitative data from the students and 2) quantitative data from usage statistics and measured student performance. The combination of these two sources allows for triangulation of data, providing a more holistic picture of the overall impacts across these three foci.

The monitoring of the impacts on the initial PI FYE cohort from the perspective of students was carried out through a combination of a comprehensive end-of-semester student survey, frequent questionnaires and periodic reflective writing pieces. The comprehensive survey questions focused on the areas of advising and counselling, use of resources (library, ILC, tutorials, office hours), learner training, and academic development. A 25% per cent response rate was received, down slightly from that of 2011 and 2012, when the same survey had been administered to the freshmen cohorts from those years as part of the continuous improvement cycle. The data from the fall 2011 and fall 2012 freshman cohorts served as baseline data for the fall 2013 cohort, the first to participate in the comprehensive PI FYE. Additionally, throughout a semester, each workshop was assessed through a questionnaire where students are asked a number of questions ranging from the usefulness of the workshop to how much it was enjoyed. Finally, reflective writing was incorporated into the ENGR 101 course requirements. Among the reflective writing pieces were two in which students were asked to reflect on their development in the area of time management and a final reflection piece that was included in the course portfolio focused on their perceptions of the impacts of the PI FYE experience on them as students. These reflective pieces were read, emergent themes identified, and then coded based on these emergent themes. These three components provide the students’ perspective regarding impacts in terms of level of engagement, personal development, and promotion of positive relations.

The findings were triangulated through collection of quantitative data regarding actual usage of resources and academic development. This includes tracking student use of tutorials, ILCs and the library via a Student Data Logger system. The PI FYE passport was used as a second source of quantitative data, providing accurate records regarding student participation in workshops, library use, advisor visits, participation in social activities and community service. The final source of quantitative data, which will only be touched upon tangentially in this paper as the program was first implemented in fall 2013, is student academic performance in subsequent semesters. Together with the data gathered from the surveys, questionnaires and the reflective writing we are able to answer Hardie’s suggested question of ‘how well we are doing’.

**DISCUSSION OF IMPACTS**

Overall, the data indicate a strong level of student satisfaction with the PI FYE program. This satisfaction is manifested in enhanced engagement across a number of targeted areas. Students also perceive that they have developed in the areas of learner training and academics, though the impacts are not as strong as in the area of engagement. Finally, across much of the data there are indications of impacts on developing students’ sense of belonging.

1. **Student Satisfaction**

The larger, long-term goals of PI FYE program necessarily focus on student retention and performance in degree courses. The more immediate goals, however, are to provide a program which not only engages students, but one which gives them a quality and enjoyable first year experience. Assessing student levels of satisfaction were therefore seen as a useful early indication of the success of the program.

The student workshops presented by faculty and staff from across campus, not necessarily involved directly with development of the PI FYE, were evaluated each week. The feedback was consistently positive. In answer to the question ‘Overall, how would you evaluate this workshop’, an average of 86% of students described the workshops as excellent, 12.5 % as good and 1.5 % as fair. When asked if they would recommend the workshop to their friends, an average of 97% said that they would. The results were interesting as, while they were key to the success of the program, it was felt that it would take time for students to adjust the concept of attending workshops in their free time. To receive such positive results was not only a validation of making it a central plank of the PI FYE, but an indication that the FYE students were satisfied with this aspect of the program.

Student satisfaction with the program in general was also evidenced in the comprehensive survey that was given to the first FYE cohort. Compared with the responses received in years prior to the introduction of PI FYE, the results are again encouraging. Students were asked to describe their freshman year. Ninety-three percent (93%) of students who
participated in PI FYE described their overall experience as positive, up from 84% in previous years, with twice as many PI FYE students reporting a “very positive experience” as compared with previous cohorts.

Likewise, the reflective writing that formed part of the students’ end of semester portfolio suggested that the program had been well received. One student admitted to hating the library when he arrived but “after FYE enjoying my time there.” Another reported that PI FYE “helped me study day by day and not just on the day of the exam.” Many spoke of the direct influence the workshops had had, highlighting personal growth, improvement in time management and “good interaction with faculty and staff” as ways in which they had benefited directly from the program. While not all feedback was universally popular, over 75% of the comments were positive, with one student concluding that “The FYE is perfect for new students like us.”

II. Engagement

Student satisfaction was clearly of significant importance, but perhaps of even greater importance was the extent to which PI FYE was able to engage students. Attendance at workshops, visits to advisors and counselors, participation in social activities and completion of the passport (recommended but not compulsory) were all monitored and compared, where possible, to previous semesters.

One area where there was a significant increase in student activity was in the number of students utilizing the ILC. The average number of monthly visitors in the first four months of the 2013-14 academic year was 7288, nearly double the number of visitor, 3702, during the same period of the 2012-13 academic year. This jump in users coincided with the launch of PI FYE and while it is important to recognize that the figures are PI-wide, the impact of the FYE program is clear.

Similarly, attendance at workshops saw a dramatic increase compared with the previous semesters. In spring 2013, the average attendance at the ILC-based workshops was 10.2 students per workshop, compared to 19.3 during the semester that PI FYE was introduced. Indeed, several workshops had to be repeated due to student demand. This further demonstrates the effect the PI FYE had on motivating first year students.

The student passport system described earlier was initially met with some resistance by the students, but it quickly became something of which they were proud. By the end of the semester, 70% of students had participated in the recommended 4 workshops, with 84% attending 3. Seventy eight percent (78%) of students had visited their advisor or counselor at least three times, with 90% meeting twice. In the end of semester survey, 60% of students reported that they had “met with [their] advisor 2-3 times per semester, on [their] own initiative”. This is a dramatic increase when compared with the 25% of non-FYE freshmen cohort students who had responded positively to this prompt.

The statistics regarding levels of engagement are confirmed by student self-reporting on the Freshman Survey. Compared with previous cohorts, PI FYE students report being more aware of what is expected in university studies, more strongly agree that counseling is available and helpful and indicate that they are more likely to make use of additional resources more frequently.

This evidence of increased use of the learning resources and greater interaction with advisors, counselors and faculty, often self-initiated, suggests that the model is working, at least in achieving the short-term goals of learner independence, motivation and greater engagement in the PI community. While early in the evaluation process, it also appears to be having an impact on key aspects of development linked to academic persistence.

III. Development

As indicated above, comparison of survey results with previous cohorts indicates that PI FYE participants are more aware of what is expected in university studies. Sixty one percent (61%) of respondents from previous cohorts had indicated that the workload in university was “much greater than expected”, a perception that dropped to 43% for PI FYE participants. Being more aware of the expectations is an important first step to being successful in university studies. A second step is to develop the academic skills necessary for success at the university level. Ninety one percent (91%) of PI FYE cohort respondents agreed or strongly agreed with the statement that their study skills had developed, compared with 82% of previous cohort respondents. While developing time management skills is heavily emphasized across PI FYE components, the percent of respondents indicating that PI FYE had helped them improve in this area decreased slightly from previous years. That being the case, reflective essays provide ample evidence that students’ use of time management strategies did develop over the course of their first semester. However, one area continues to be a cause for concern – the average amount of time spent studying outside of class. Ninety percent (90%) of PI FYE respondents indicated that they spend less than 15 hours per week studying outside of class, far below the recommended levels for engineering study.

Acquisition of knowledge in subject areas and overall achievement levels of defined Student Learning Outcomes will be part of the evaluation of the program that will occur in coming years. That being the case, it is encouraging to see that the percentage of PI FYE respondents agreeing or strongly agreeing that they have developed a good knowledge of basic Chemistry concepts increased significantly over previous cohorts (99% versus 82%). There was no significant change in the percent of students self-reporting an increase in Calculus knowledge and the ability to apply that knowledge, nor in the level of development in the areas of presenting and writing. Grade distribution data in the core courses taken by PI FYE students during their second (spring) semester at the Petroleum Institute indicate a reduction in DFW rates in the introductory Chemistry course, and increased percentages of students earning higher grades in their other courses when compared to the three year average
from previous spring semesters. The expectation is that the enhancements in academic skills will eventually translate into further improved academic performance and achievement of intended Student Learning Outcomes. Analysis of data related to these areas has just begun. The final measure of development will be in terms of persistence and achievement in future courses.

IV. Relationships

It has long been recognized that establishing positive relationships is a key factor in student persistence and retention, and this was a driving force behind establishing the living-learning community at PI. The results discussed above indicate that the PI FYE has led to enhanced levels of interactions with advisors and peers. The program has also led to solid levels of participation in social events, with 91% of students participating in at least one social event during the semester, and 64% participating in three or more social events per semester. Seventy percent (70%) also participated in a documented community service project. Anecdotal stories about how students help and support fellow cohort students abound. In analyzing the end of semester student reflections, social relationships emerged as a theme, though students had not been asked to specifically address the issue. Students noted the valuable impact on the development of their personality, and highlighted how FYE provided important opportunities to socialize with peers and make new friends. In the words of Ali, the PI FYE “gives students a chance to socialize amongst each other, as well as benefit from each other’s company during studying sessions.” Fahad expands on this idea, writing that the “FYE program was one of the best experiences I ever had, because it was mixture academic work and non-academic work, such as volunteering and helping the society. I believe FYE helped me a lot to be successful in my courses and in my social life. I could make new friends and new relationships with instructors.”

CONCLUSIONS

The PI FYE program was introduced and appears to be both successful and popular. PI FYE students report being more aware of what is expected in university studies, feel they are challenged at an appropriate level, and are significantly more likely to use their own initiative to meet with their advisor. The findings also show that the vast majority feel that their courses have helped them develop their skills and that they self-report an increase in knowledge and the ability to apply that knowledge. Students also report an overall positive experience (93% for PI FYE, up from 84%), with twice as many PI FYE students reporting a “very positive experience” as compared with previous cohorts. As the program develops, we will continue to monitor the impacts on students in terms of engagement, development and a sense of belonging. We will also commence more detailed evaluation of the program – examining student persistence and performance in their degree courses and eventually their careers. This will be the true test of the overall impact of PI’s Freshman Year Experience. We hope to receive even more comments such as that from Abdullah: “It was one of the best experiences I have had, not just in university but also in my whole life because it was a mixture between encouraging students to study and manage their time, volunteer and help their society and playing and having fun.”

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