Nuclear Workforce Development Scholarships and Enhancements Program
Phase I: Outreach and Recruiting

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I. Abstract

Funded by U.S. Nuclear Regulatory Commission, Nuclear Workforce Development Scholarships and Enhancement Program at Texas A&M University-Corpus Christi (TAMUCC) has been designed to provide five Scholarships for $6000 per semester for Mechanical Engineering and Engineering Technology undergraduate students who are pursuing an educational emphasis in nuclear power and who desire to contribute to the design, construction, operation or regulation of the nation’s nuclear facilities. Recruiting for the nuclear-related workforce, particularly among traditionally underrepresented minorities, is of vital importance to both the economic future and security of the nation. The proposed effort also includes a collaborative enhancement program between Texas A&M University-Kingsville and TAMUCC to help in recruiting, mentoring and marketing efforts for the students in the fields of nuclear power, science and health physics. This paper presents Year I efforts and the results in terms of outreach and recruiting at TAMUCC.

Initially, an outreach and recruiting effort was carefully administered to target and attract students interested to be part of the nuclear related workforce in the U.S. First, an outreach effort targeting regional area public and private high school graduating seniors and existing students in the university was organized to advertise and promote the scholarship program. This effort included high school visits and teacher networking, participation in college day fairs and internet posting through various websites. After months of effort in the middle of Japan’s Fukushima nuclear disaster, a total of seventeen applications were eventually received by April 1st deadline.

Secondly, a scholarship selection committee was formed by the university faculty, staff and a local industry representative to provide a fair selection process. The selection criteria included actual class rank, SAT/ACT scores, financial need status, reference letters, essay writing skills and whether the candidate was first generation U.S. resident college student. Each committee members’ rankings weighed equally to determine the overall student eligibility ranking. The candidates were later contacted with official scholarship offer letters. The selection of five candidates out of top nine was realized in three rounds of contacting of two weeks of time periods. The recipients included four incoming freshmen and one existing university student.

Finally, to implement an evaluation plan with the purpose of measuring this project’s early impact in attracting and retaining students for careers in nuclear power, a first semester intake survey of not only award candidates but their peers recruited into the Engineering and Engineering Technology program was conducted. In this paper, we discuss the details of this program as it was implemented in the first year, with the latest findings.

II. Introduction

Increasing energy demand in the 21st Century comes with important challenges such as environmental impacts, sustainability and cost effectiveness. One of the most useful forms of energy is unquestionably electrical energy. Therefore, recognizing our additional need for energy, cleaner electric energy generation through renewable sources (especially wind and solar)
and nuclear power gained quite a momentum over the recent years. For instance, as of November 2010, U.S. Nuclear Regulatory Commission has received 18 combined license applications for a total of 30 new reactors\(^1\). In addition, due to low variable operating costs, nuclear power plants in the U.S. historically have had very high utilization rates of around 90%, which is the highest among all energy sources\(^2\).

With this growth in the energy industry to meet the increasing energy demands, the need for technical talent to support the energy workforce is obvious. To educate and prepare the skilled workers for the nuclear and power workforce, recruitment efforts are necessary, as students typically shy away from disciplines that are heavily dependent on math and sciences, due to the rigor of such programs; therefore, it is important to expand recruitment efforts from colleges to high schools.

On August 8, 2005, President Bush signed into law the Energy Policy Act of 2005 (EPA), which authorized Nuclear Regulatory Commission (NRC) to establish and participate in partnership programs with institutions of higher education, including Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), and Tribal Colleges and Universities (TCUs), to enhance their capacity to train students, including present or potential NRC employees in fields that the NRC deems critical to its mission\(^3\). To that extent, NRC established and administers its Minority Serving Institutions Program (MSIP) by its Office of Small Business and Civil Rights (SBCR).

In 2010, Mechanical Engineering and Engineering Technology program at TAMUCC was awarded $180,000 for its Nuclear Workforce Development Scholarships and Enhancement (NWDSE) program by NRC’s MSIP. This scholarship program was started in the fall of 2010 and runs through 2013. This paper describes the first year undergraduate student outreach and recruitment activities of the NWDSE program to encourage students to enter into nuclear related engineering and technology disciplines in a Hispanic Serving Institution.

**Recruitment Efforts into STEM Fields**

With the obvious need for the engineering workforce in the near future, many educators at universities have taken on creative recruitment activities to help increase student enrollment in STEM fields. Recruitment efforts for engineering and nuclear fields are definitely not restricted to the recent past. Bozynski and McCowen describe student-initiated summer recruitment camp for engineering called Science Quest aimed at elementary school children in Kingston, Canada, through Queen’s College, which started in 1988\(^4\). Each student carried out two projects every day for one week, in addition to one group project that lasted one week. The individual projects ranged from casting to design related projects, with hands-on experiences. The authors explain the expansion of this summer program due to its success. More recently, Gleason et al. describe an Engineering Math Advancement Program (E-MAP) which is aimed to help students with calculus in preparation for engineering\(^5\); the program, in addition, offers “living-Lab” hands-on exercise, field trips and a service-oriented project that gets the students involved in the community. The authors report that the retention of students increased by 12% in three years after the implementation of the E-MAP. Describe the creation of student learning communities as a recruitment tool\(^6\). Tester et al. describe a Design4Practice (D4P) curriculum enhancement
implementation to increase recruitment and retention of students in engineering fields. Their study was aimed at identifying best practices in recruitment and retention of students in engineering fields that could be applied to their curriculum through the Multicultural Engineering Program (MEP). The authors note that “service learning” can be applied in the education protocol. With strong service-related activities, the college students can tackle not only environmental issues, such as renewable energy, but the practice can also be expanded to high school students. A study performed at University of Illinois at Urbana-Champaign revealed through student surveys that some of the factors that would assist with student recruitment and retention include providing more connections to the engineering workforce; providing more orientation for incoming students; increasing the quality of instruction; improving the process of selecting teaching assistants; and improving the engineering curriculum. In a recent nuclear science and engineering related outreach and recruiting effort, Landsberger, et al. propose to work with Historically Black Colleges and Universities and other Minority Serving Institutions (HBCU/MSI) to increase enrollment at the graduate level to provide a better higher educated engineers and health physicists. The next section is an account for justification for enhanced recruitment and retention efforts in power related fields.

Demands of Nuclear Power Industry in Texas

For several years it has been projected that the current nuclear power industry will soon be facing a manpower crisis due to attrition within its “soon-to-be-retiring” workforce. Estimates for the number of nuclear power industry workers that will be needed in the near future have shown that we must recruit many more individuals than we have recruited in recent years, and that imperative, in turn, demands that a concerted effort must be placed on recruiting individuals from non-traditional student populations. TAMUCC is designated as a Hispanic Serving Institution (HSI) which means that the Hispanic student population is at least 25% (over 42% in Fall 2012). Underrepresented students have historically not entered careers in nuclear power fields and are, therefore, exactly the students who should be targeted today. Consequently, our university entered into a partnership with the Nuclear Power Institute or NPI, which is a Texas-wide partnership led by the Texas Engineering Experiment Station (TEES) and headquartered at Texas A&M University to attract students, especially traditionally underrepresented students, into careers in nuclear power and science.

With eight new nuclear reactors approved to be built in Texas along with the aging workforce, the need for skilled workers is growing rapidly. These reactors require hundreds of permanent full-time employees with undergraduate degrees in engineering, engineering technology and engineering physics, with an understanding of nuclear power plant technology, as well as skilled workforce with associate degrees in nuclear power plant systems, radiation protection and digital instrumentation and control. More specifically, around 450 skilled workers will be required for each of the eight nuclear plants planned for Texas, among the thirty-one plants planned for the U.S.A. This number translates to a need for 3600 skilled workers in Texas, two-thirds of whom are expected to hold plant technician positions with a two-year degree, and one-third holding a four-year degree in engineering disciplines, including nuclear engineering, mechanical engineering, electrical engineering and engineering technology.
**TAMUCC and NPI Partnership**

The past activities associated with this partnership have included both nuclear power curriculum development and student recruiting efforts in The Department of Engineering and Computing Sciences, Mechanical Engineering and Engineering Technology (ME/ET) Program. The program has an undergraduate enrollment of 370 students in fall 2012 at TAMUCC which includes total of three majors of specialty including Mechanical Engineering, Mechanical Engineering Technology and Electrical Engineering Technology. While Mechanical Engineering (ME) is a recently established major, both Mechanical Engineering Technology (MET) and Electrical Engineering Technology (EET) are well established and ABET accredited majors serving the region since 2002. Bachelor of Science degrees are offered in all the three majors.

Through the NPI partnership, the nuclear power certificate that has been developed is adapted to support the power industry in Texas. Specifically, the electrical engineering technology curriculum was selected to comprise three on-site common fundamental power systems courses\(^{11}\) in order to address major power education components including generation, transmission and distribution, and protection systems. The on-site courses that have been added to the curriculum are Energy Conversion, Power Transmission and Distribution and Power Protection Systems. These three on-site courses are senior elective level courses to define “power emphasis” in the program, particularly, in Electrical Engineering Technology.

The certificate courses also include additional two on-line courses that are offered by NPI. These courses are selected with advising faculty’s guidance from the online course offerings provided by NPI which include:

1. Nuclear Power Plant Fundamentals
4. Nuclear Power Plant Operations
5. Human Performance for Nuclear Power Plant Engineers

With the program and activities sponsored by NPI in place, NWDSE program funds at TAMUCC will be expected to play a key complementary role to attract quality students of Texas into careers in nuclear power which is of national importance. Therefore, for the purpose of their key educational development, NWDSE program scholarship students will be required to take these certificate courses as part of their scholarship agreement.

**III. The Nuclear Workforce Development Scholarships and Enhancement Program**

The Nuclear Workforce Development Scholarships and Enhancement Program described here were composed of two main parts: the first part involved raising awareness to the NRC scholarship program and recruiting students, who demonstrated a sincere interest in nuclear-related fields, to the program through the NRC scholarships. Underserved student groups in STEM fields were targeted to attract graduating high-school students and first-semester freshmen as the first priority, followed by sophomore students, and in exceptional situations, upper classmen. Students were chosen with considerations described in the next section and such that they would have sufficient time to complete the additional courses required by the scholarship...
terms. The students participating in the program agreed to seek employment and be employed in
the nuclear industry, labs, or research facilities after graduation for a period of time determined
by the length of time they received the NRC scholarships. This commitment was typically six
months of employment for every partial or full year of scholarship received.

The second part involved the enhancement program. This part included student support activities
to ensure continued student interest in the STEM fields and nuclear programs, talent
development through STEM course support, such as tutoring, undergraduate research
opportunities, field trips that included visits to the collaborating institution and career fairs, and
working lunch meetings where the scholarship recipients came together. The enhancement
program involved tracking students’ academic success, and identifying their weaknesses in an
effort to offer remedies and tutoring support as needed. Students were also encouraged to
participate in guest speaker presentations related to power, besides the nuclear and power
emphasis courses they were to take as part of the scholarship requirements. The enhancement
program involved workforce development through exposure of student to nuclear fields in
nuclear power, science, and health physics.

IV. Outreach and Recruiting Activities

NWDSE Program is expected to play an integral part in TAMUCC’s recruitment activities for
the expansion of the national nuclear-related workforce. Members of TAMUCC School of
Engineering and Computing Sciences (formerly Department of Computing Sciences) ME/ET
Program along with the university as a whole engage in an active many-pronged recruitment
program. The recruitment program includes taking trips to regional high schools and community
colleges, drawing upon the department’s service course base to recruit from within and outside
the university, organizing regional engineering competitions among high school students, and
engaging in other activities that enhance the recognition of the program both within the
community and throughout the region.

To this extent, comprehensive electronic marketing materials such as a flyer, poster and World
Wide Web page were designed with the help from a computer science graduate student assistant.
The following list summarizes the recruiting and outreach activities in fall and spring of 2010-
2011 academic year:

- The regional high school counselors were visited and introduced to the NRC scholarship
  opportunity.
- NRC Scholarship stand was setup during Island Days recruitment events at TAMUCC.
  NRC scholarship flyers were distributed and the program was introduced to interested
  parties. Island Days are TAMUCC’s campus preview program, designed especially for
  prospective undergraduate students and their families to learn about the life of a
  TAMUCC student.
- Various high school science and math teachers were invited and participated in
  TAMUCC workshop\textsuperscript{12} in 2010 summer, who were also informed about NRC
  scholarships, and given flyers to distribute among their prospective graduates.
- An area high school with emphasis on Engineering, Environmental & Marine Science
  was visited several times and students/teachers/counselors informed about the NRC
  scholarship opportunity.
The department organized a regional Engineering Competition on March 5th, 2011. Many students from local high schools, middle schools and community colleges attended the event. During the event the attendees were introduced to the nuclear workforce needs and NRC scholarship opportunity.

Admitted students to ME/ET programs were also informed through email and the University’s financial aid office about the scholarship opportunity.

In addition, the scholarship opportunity was announced and offered to existing students of the ME/ET programs with an application deadline of early May, 2011. Based on these applicants, another screening process was later conducted.

V. Applicant Evaluation and Selection Process

Applications were received in early May. After the application packages were obtained, a committee of five, composed of three faculty members, one staff member (educational program coordinator) and one industry advisory board representative from industry, evaluated the applicants based on the established criteria. The selection criteria included actual class rank, SAT/ACT scores, financial need status, reference letters, and an essay which demonstrated the student’s writing skills as well as his/her interest in participating in the nuclear workforce after graduation. First generation college students were also assigned additional points in the ranking process. Each committee members’ rankings were weighed equally to determine the overall student ranking. The candidates were later contacted with official scholarship offer letters. The selection of five candidates out of top nine was realized in three rounds of contacting of two weeks of time periods, giving an opportunity to students next in line, in case an awardee did not accept the scholarship. In the first implementation of the NRC Scholarship program, the recipients included four incoming freshmen and one existing university student. Two were Hispanic students and one was an African American student. Table 1 shows the evaluation matrix used in the selection process.

Table 1. Rubric used in the NRC scholarship recipient selection process

<table>
<thead>
<tr>
<th>Selection Criterion</th>
<th>Maximum Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essay</td>
<td>5</td>
<td>Writing skills and demonstrated interest in nuclear fields</td>
</tr>
<tr>
<td>Reference Letters</td>
<td>5</td>
<td>Strength of support and confidence on student’s success</td>
</tr>
<tr>
<td>Financial need</td>
<td>3</td>
<td>Unmet financial need, PEL grant eligibility and FAFSA</td>
</tr>
<tr>
<td>Class Ranking</td>
<td>5</td>
<td>Suggested: Relative, based on applicant pool</td>
</tr>
<tr>
<td>SAT/ACT</td>
<td>5</td>
<td>Suggested: Relative, based on applicant pool</td>
</tr>
<tr>
<td>First Generation College Student</td>
<td>2</td>
<td>Preference is given to students who are the first in their family to attend college</td>
</tr>
<tr>
<td>TOTAL</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>
VI. End of First Semester Evaluation Results

The following charts and analyses show the survey (included 15 questions) results conducted at the end of the first semester.

Since the first semester, one student has transferred to another college, and one student has decided not to pursue mechanical engineering/engineering technology degree at this time. Two new students have been awarded scholarships in their place who were both upperclassmen. These students have chosen power-related capstone projects (one on spent nuclear fuel device design, and one on smart home energy control system), further exposing additional students to nuclear power and supporting fields, improving the awareness of these fields among other students involved, and indirectly enlarging the pool for the nuclear workforce.

Figures 1 shows the details of the survey results to the following 11 questions for one freshmen introductory engineering technology course:

1. I plan to complete a degree in Electrical Engineering Technology (EET), Mechanical Engineering Technology (MET) or Mechanical Engineering (ME).
2. I am excited about a career based on my major in EET, MET or ME.
3. The funding provided by my NRC scholarship is important to my being able to pursue my degree.
4. I believe it is important for me to participate in NRC activities focused on recruitment of new students.
5. I believe having a mentor would be beneficial to me as I pursue my degree in EET, MET or ME.
6. I would like to get better acquainted with other NRC scholars.
7. NRC/program leadership organizing fun social activities for participating students would be a good addition to the project.
8. The application process for NRC was easy for me to complete.
9. The expectation for NRC scholars to maintain at least a 3.0 GPA overall and within major is reasonable.
10. I would like to participate in campus seminars targeting topics such as study habits and writing skills.
11. I have participated or would like to participate in professional seminars.

The following is the analysis summary of the survey results for these questions for all four courses including three freshmen and one senior level course:

ENTC 1303 – Introduction to Engineering Technology; n=18; Number of NRC scholarship recipients =2
ENGR 1211: Foundations of Engineering I; n=23; number of NRC scholarship recipients =1.
ENGR 1210 Introduction to Engineering; n = 17; number of NRC scholarship recipients = 1.
ENTC 4415 Project Justification and Management; n=9; number of NRC scholarship recipients = 0.

Question #1: For the freshmen (first three) classes, 16 out of 18 (89%) students in ENTC 1303, 20 out of 23 (87%) students in ENGR 1211, and 13 out of 17 (76%) students in ENGR 1210 strongly agree or agree that they plan to complete a degree in Electrical Engineering Technology.
(EET), Mechanical Engineering Technology (MET) or ME (Mechanical Engineering). This percentage jumps to 100% for the senior level class.

Question #2: Similar to question #1, 15 out of 18 (83%) students in ENTC 1303, 19 out of 23 (83%) students in ENGR 1211, and 12 out of 17 (71%) students in ENGR 1210 strongly agreed or agreed that they are excited about a career based on their major in EET, MET or ME. For senior students in ENTC 4415, this percentage is 78%.

Figure 1. ENTC 1303 – Introduction to Engineering Technology; n=18; Number of NRC scholarship recipients =2

Question #3: In ENTC 1303, there were two students receiving NRC scholarship. Even with this fact, 50% strongly agreed or agreed that funding provided by NRC is important for pursuing a degree in EET, MET or ME. The remaining students responded that this did not apply to them (they did not receive the scholarship) or disagreed, with a similar suggestion that they did not receive NRC funding. In ENGR 1211 only one student was a recipient of an NRC scholarship. Even then, 3 out of 23 students strongly agreed that NRC scholarship was important to pursue a degree in EET, MET or ME. The remaining 20 students stated that this question did not apply to them, since they did not have an NRC scholarship. In ENGR 1210, only one student was an NRC scholarship recipient. 4 out of 17 strongly agreed that NRC funding is important for pursuing an EET, MET or ME degree. 9 out of 17 indicated this question did not apply to them since they did not receive NRC funding; 4 out of 17 remained neutral or disagreed with this question, since it did not apply to them. In the senior class where there are no recipients of NRC scholarships, 5 out of 9 strongly agree or agree about the importance of NRC scholarships to pursue a one of the
technical degrees. 4 remained neutral (1) or indicated this question did not apply to them (3), since they were not an NRC scholarship recipient.

**Question #4**: In the fourth question, the students were asked the importance of participating in NRC activities focused on recruitment of new students. In ENTC 1303, 8 out of 18 (44%) strongly agreed or agreed that it was important for students (NRC recipients) to participate in activities focused on recruitment of new students. 10 out of 18 (56%) students were either neutral (6), disagreed (1) or stated ‘not applicable’ (3) indicating this question did not apply to them, since they were not NRC scholarship recipients. Similar results were observed in ENGR 1211 and 1210. 2 students strongly agreed with the statement in 1211, while the rest of the students remained neutral (2) or indicated this question did not apply to them (19). In ENGR 1210, 10 out of 17 students strongly agreed or agreed to the statement that it is important for NRC students to participate in NRC activities focused on recruitment of new students, while 7 students responded neutrally (1), or stated ‘not applicable’ (6) indicating that they were not NRC scholarship recipients. In the senior ENTC 4415 class, the response was similar, with 4 out of 9 students strongly agreeing or agreeing to the importance of participation in NRC activities for recruitment of new students, whereas 5 out of 9 students remained neutral (1) or indicated ‘not applicable’ to indicate they were not participating in the NRC Scholarship Program.

**Question #5**: The majority of the students strongly agreed or agreed a mentor would be beneficial for them while they pursued their degree in EET, MET or ME. In the case of ENTC 1303, 15 out of 18 (83%) students strongly agreed or agreed about the contributions of a mentor during their major studies. In ENGR 1211, 17 out of 23 (74%) students strongly agreed or agreed to the same. 13 out of 17 (76%) students in ENGR 1210 strongly agreed or agreed to the same. In the senior level ENTC4415, the results were even more convincing; with 8 out of 9 (89%) students agreed a mentor would be beneficial while pursuing their degree.

**Question #6**: In ENTC 1303, 10 out of 18 (56%) of the students strongly agreed or agreed that they would like to get better acquainted with the NRC scholars. This was an interesting finding, since even the non-NRC scholarship program participants indicated that they would like to get to know the NRC scholars. In ENGR 1211, 2 out of 23 students indicated that they would like to get to know the NRC scholars, which was a more intuitive result, considering that there was only one NRC scholarship recipient in this class. The majority of this class indicated this question did not apply to them (16) or remained neutral (4), again suggesting that they were not NRC scholarship recipients. In ENGR 1210, 11 out of 18 strongly agreed or agreed that they would like to get to know NRC scholars better, with 7 remaining neutral about this question, suggesting they were not participating in the NRC program. In the senior class, 5 out of 9 strongly agreed or agreed about their interest to meet with the NRC scholarship recipient, while the rest of the students remained neutral or disagreed, which is expected, since these students were in their last year and about to graduate.

**Question #7**: One of the proposed activities of this NRC scholarship program was to help students in the program form a support group among one another, network, and obtain a sense of belonging. In ENTC 1303, ENGR 1210 and ENTC 4415, the majority of the students thought organizing fun social events for participating students would be a good addition to the program, with 10 out of 18 (56%, ENTC 1303), 14 out 17 (82%, ENGR 1210) and 7 out of 9 (78%, ENTC
4415) strongly agreeing or agreeing to this statement. In ENGR 1211, the majority of the students remained neutral (3) or stated ‘not applicable’ (17), since they were not NRC scholars, with only two strongly agreeing or agreeing to the statement.

**Question #8**: In ENTC 1303, 6 out of 18 students strongly agreed or agreed that the application process for the NRC scholarships was easy to complete. 6 students stated ‘not applicable’ and 5 remained ‘neutral’ perhaps indicating that they did not apply for the NRC scholarships. In ENGR 1211, only one student strongly agreed with the ease of the scholarship application process. The remaining students indicated ‘not applicable’ (20) or neutral (2), suggesting they did not apply for the NRC scholarships. In ENGR 1210, about half the students agreed the application process was easy to complete, whereas the other half did not participate in this process, suggested by the neutral or ‘not applicable’ responses. In ENTC 4415, 7 out of 9 students remained neutral (2) or stated ‘not applicable’ (5) suggesting they did not apply for the scholarships.

**Question #9**: In ENTC 1303, ENGR 1210, and ENTC 4415, the majority of the students strongly agreed or agreed that maintaining a GPA of 3.0 overall and within major was reasonable to keep the scholarship. In ENGR 1211, the majority of the students responded ‘not applicable’ or neutral (18), with only 4 students expressing an opinion that stated strong agreement or agreement with the statement.

**Question #10**: In the three freshmen-level courses, the majority of the students agreed to the statement that they would like to participate in campus seminars on study habits or writing skills. In the senior level class, the majority of the students responded neutrally or disagreed. This is expected, since by this time, senior students should have mastered these skills already.

**Question #11**: The answer to this question was the most surprising: The highest ranking response in each of the four classes was a neutral response to the statement that the students would like to participate in professional seminars.

Figure 2 shows the response of the introductory engineering technology class ENTC 1303 to the following four survey questions:

12. Has your NRC scholarship, along with other financial resources, provided enough support that you can focus on pursuit of your degree without having a job?
13. Do you have a job related to your major in order to gain real-world experience?
14. Have you participated in undergraduate research at TAMUCC?
15. Would you like to begin and/or continue participation in undergraduate research at TAMUCC?

The following is the analysis summary of the survey results for these questions for all four courses mentioned above.

**Question #12**: In ENTC 1303, 4 out of 18 students indicated that the NRC and/or other financial support they were receiving were sufficient for them to pursue their degree without seeking a job for extra income. 4 out of 18 indicated that their financial support solely was not sufficient to support their studies without a job. This question did not apply to 10 out of 18 students. In ENGR 1211, 2 recipients agreed that their funding support was sufficient for them to concentrate
on their studies without another job, while this question did not apply to 21 out of 23 students of the class. In ENGR 1210, 3 of the 5 students receiving either NRC and/or other financial support indicated that the scholarships or financial aid they were receiving were sufficient for them to focus on their studies, whereas 2 of the 5 indicated the money they received was not sufficient to continue their studies without a job. This question did not apply to 12 of the 17 students. Finally in ENTC 4415, only one out of 8 respondents indicated financial support of any kind which was not enough to focus on studies without a job.

**Figure 2.** ENTC 1303 Introduction to Engineering Technology; n=18; Number of NRC scholarship recipients = 2

**Question #13:** Only 2 students in ENTC 1303 (11%) and ENGR 1211 (9%), and only 1 student in ENGR 1210 (6%), held jobs related to their major that provided them the real-world experience in their field. In ENTC 4415, the percentage jumped to 50%, which is expected, as seniors have many more technical courses to be eligible or technical positions than freshmen students.

**Question #14:** As intuitively expected, the majority of students did not participate in undergraduate research in freshmen courses, whereas the majority of students did participate in undergraduate research in the senior course at TAMUCC. Only 3 out of 18 students (17%) in ENTC 1303, 4 out of 23 students (17%) in ENGR 1211, and 5 out of 12 students (29%) in ENGR 1210 participated in undergraduate research at TAMUCC. In the senior ENTC 4415 course, 7 out of 8 students (88%) of students participated in undergraduate research at TAMUCC.

**Question #15:** An overwhelming majority of students in each of the four classes at both freshmen and senior level indicated that they would be interested in beginning or continuing undergraduate research at TAMUCC, with 17 out of 18 students (94%) in ENTC 1303, 20 out of 23 students (87%) in ENGR 1211, 15 out 17 students (88%) in ENGR 1210, and 7 out of 8 students (88%) in ENTC 4415 indicated interest in beginning or continuing undergraduate research.

The survey involving students who are not part of the program is important to show the student opinions on the significance of the nuclear program and initiative, as well as scholarships to pursue this program. In addition, surveying students who are not part of the program is expected to help identify potential differences and similarities of opinion among the surveyees. Significance of the program is apparent from the surveyee responses.
VII. Conclusions

The primary goal of this paper is to disseminate the knowledge in developing an educational/support program to promote education, and awareness in nuclear related fields to assist the nuclear workforce pipeline. It is clear that there will be a need for skilled workers in the nuclear power fields in the near future. The universities are responsible for preparing students for positions in these fields; however, the role of universities and educators are shifting from just education to include recruitment and retention efforts as well. In this paper a multi-faceted recruitment and related activities engaged in at TAMUCC through the support of NRC-MSIP has been presented that aims to alleviate shortages in the workforce in nuclear-related or supporting fields. TAMUCC has adopted a power emphasis in its Engineering Technology program, and offers energy related courses in its mechanical engineering program. In addition, through partnership with NPI, the University offers certificates in nuclear power to support the foreseen needs of the nuclear and power industry. As part of outreach and recruitment efforts, NWDSE program aimed at high school students as well as existing students demonstrated the success of this endeavor. The survey results and follow ups conducted through scholarship recipients in the first semester revealed that the scholarship is a valuable tool for educating the next generation of power professionals. The effect of the first year activities of NWDSE program will most likely take some time to reveal; however, the preliminary information supports the importance of scholarships to encourage and draw students to nuclear power and related fields as well as help them succeed in their selected curricula.

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