AC 2008-1843: THE FIRSTE FIFTEEN YEARS

Joan Kowalski, Penn State University - New Kensington

Joan A. Kowalski earned both her Bachelors and Masters Degrees in Civil Engineering from Penn State University. In 1987, she joined the faculty at the Penn State New Kensington Campus, where she has advanced to the rank of Senior Instructor in Engineering. In 1999, she assumed the role of Program Director for the Mechanical Engineering Technology (MET) Program. She co-founded the Females Interested in Reaching for Science, Technology and Engineering (FIRSTE) Program in 1993 and continues serving as a co-director. This program is designed to attract high school females towards nontraditional careers such as engineering. Joan also displays her dedication to mentorship as advisor to the Society of Women Engineers (SWE) student chapter on campus along with advising the Tau Alpha Pi (TAP) National Honor Society for engineering technology students of the Iota Beta Chapter, Penn State New Kensington. Over the years, Joan has received numerous awards including the prestigious Penn State University's Women's Achievement Award in 2003 because of her commitment to the FIRSTE Program and other effective mentoring activities both on campus as well as within the community. In addition, Joan was the recipient of the Excellence in Teaching Award at Penn State New Kensington in 2005.

Tracie L. Brockhoff, Penn State University - New Kensington

Tracie L. Brockhoff is the Demonstration and Equipment Specialist in Biology and Chemistry at Penn State New Kensington. She has been employed full time at the campus for 23 years after having earned her Penn State degree in science. Her interests include mentoring students and helping them find their full potential through activities such as the Females Interested in Reaching for Science, Technology and Engineering (FIRSTE) Program, which she co-founded in 1993 and continues to co-direct. She is also the advisor to the Women Interested in Science Club (WISC) on campus.

The "FIRSTE" Fifteen Years

Abstract

One ongoing recruitment program is known as the Females Interested in Reaching for Science, Technology, and Engineering (FIRSTE) Program and is offered to ninth- through eleventh-grade high school girls. This two-day, on-campus event ran for the first time in 1993 and has been offered since on an annual basis; thereby, marking its fifteenth year this summer of 2007. In an effort to encourage young females to consider a nontraditional career path in engineering, engineering technology, or an engineering-related science, the directors of this program continue to procure funding from local industries, professional organizations and established foundations. The twelve selected participants explore "hands on" laboratory activities, tour a technical facility in the region, and meet with women engineers and scientists in a special mentor session.

This past summer, the program directors administered a survey to all past participants who could conceivably be college graduates at this point in time. With just a few lost contacts, the survey managed to successfully reach nearly 100 individuals who were asked to identify their degree earned, university attended and current employment situation. The response rate exceeded at least 30%, with some respondents offering gratitude for their chance at this unique experience in their life. Impressively, many of them not only attended this university, but earned at least a bachelor's degree in engineering, engineering technology, or an engineering-related science.

As a result, the program directors would welcome the opportunity to share these results which reflect a rather high rate of success along with offers of suggestions for ensuring the continuation of this long-lived recruitment program.

The FIRSTE Program

For the past 15 years, the FIRSTE Program has been following a fundamental outline for its agenda (i.e. mentors, tour, hands on session, statistical data, etc.) which is modified thematically every year. In order to best describe the essence of the FIRSTE Program, its detailed information for the most recent year (2007) is provided in the following section.

2007 FIRSTE Program

Although women have made great strides in many career fields, they still lag far behind men in engineering. According to a study presented in the National Center for Education Statistics report from August 2000, the figures for the percentage of women enrolled in engineering and engineering technology programs at the baccalaureate level is 17. Minorities account for an even smaller percentage. At the advanced degree levels, the figures are reduced even further.

The FIRSTE Program (Females Interested in Reaching for Science, Technology and Engineering) was developed by faculty and staff for young women in grades nine through eleven to encourage and guide them in preparation for matriculation into engineering, engineering technology, or science.

The fifteenth annual FIRSTE Program was held on May 15-16, 2007. Students were exposed to intensive hands-on workshops designed to stimulate interest and provide a realistic view of engineering and science-related careers. The young women had an opportunity to work on a computer-aided design project, perform practical laboratory applications, and participate in scientific exploration – skills essential to engineering practice.

The River Voyager provided a unique opportunity for the students to experience practical usages on modern technology as related to the world around them. Crew specialists met with the group to demonstrate how trusses, dams, marine wildlife, and micro organism all involve specific science and/or engineering concepts. Further, the students saw first hand how all of these items directly impact the environment in which they live.

Students were also given a chance to talk with other professional women one-on-one at a later mentoring session held on campus that night. At that time, female engineers and scientists from area industries shared their experiences with the students and answered their questions. In addition, female students currently enrolled in engineering, technology and science program further contributed to the discussion.

To give the students a collegiate experience, the program included an overnight stay in student housing. The lodging was provided at a private housing apartment adjacent to the campus.

Faculty member Joan Kowalski and staff member Tracie Brockhoff coordinated the program. Volunteers served as educators, residential supervisors, assistants and mentors.

Achievement was measured by observation and verbal feedback from the young women and their parents at a closing program and completion of an evaluation form by each participant prior to their departure. A follow-up telephone call will also be made to those of them next year who will be ready to attend college then. At present, the young women felt the program provided them with plenty of information as they ponder career choices.

No official survey was distributed to the parents because they were directly involved in the recognition dinner only. All parents and family members expressed their support for this kind of program and extended sincere appreciation for the committee's efforts.

Student Selection

Applicant Pool: Program brochures and student applications were sent directly to guidance counselors, gifted program directors, and science and math teachers in regional high schools, as well as to The Association of Home Schooling. In addition, a web site for the FIRSTE Program is accessible on line. Moreover, given the program's reputation, several applicants have approached the program directors as a result of "word by mouth" communication. Publicity is also provided by local press coverage.

The Selection Process: Ninth through eleventh grade female students, mostly from regional high schools, were asked to complete an application in which they indicated their current GPA and grade level. They also submitted a one-page essay describing their interests, hobbies, and career goals. Those students who were undecided about their career choice, but demonstrated ability in math and/or science, were given preference over those who had already chosen engineering or engineering technology as a career, with additional consideration given to minority females. This year's pool of applicants once again included students from school districts in an outlying area participating for the first time.

Cost of Program

The total cost of the FIRSTE Program for 2007 was $5,087 thanks to budgeting, volunteer efforts and creative programming. Funding from a variety of sources (both internal and external) ensured the success of the FIRSTE Program again this summer.

Annual FIRSTE Program Survey Results

For the past fifteen years, the FIRSTE Program has directed a considerable number of participants toward actually selecting engineering, science or technology as a career of choice. For others, these fields of study have at least become viable options.

This summer, all FIRSTE participants who have graduated from high school this year were surveyed by phone. Their responses, along with those from previous surveys, have been compiled into the statistics shown in the following two tables. In Table 1, eight of the ten participants from the 2004-2006 FIRSTE Programs who have reached college age have been contacted. These contacts bring the total number reached to 146 out of a possible 152 for college-ready FIRSTE participants. Over seventy percent have selected a career in the engineering, engineering technology, or science area. This number accounts for almost three-quarters of all the eligible participants reached for comment. Less than twenty percent selected some other career choice while a mere seven and a half percent were undecided at the time of high school graduation.

Table 2 shows that nearly one-third of eligible participants have committed to Penn State, with almost one-quarter of these Penn State students bound for the Penn State New Kensington location specifically. In particular, one of these graduates currently attends Penn State Kensington. She is now a senior working toward her Bachelor of Science degree in electro-mechanical engineering technology.

Regardless of the individual career choices made, it is evident that all FIRSTE participants found this exposure to the technical world with profession women to be exciting and encouraging, thereby removing some of the anxiety surrounding careers in the math and science fields.

Table 1: Annual Program Survey Results

Career Choice of Participants							
Year of Participation	**Number of Participants**	**Engineering/Engr Technology Science**		**Other**		**Undecided**	
	#	#	%	#	%	#	%
1993	12	7	7/12=58.3	5	5/12=41.7	0	0/12=0
1994	12	9	9/12=75	3	3/12=25	0	0/12=2
1995	12	9	9/12=75	3	3/12=25	0	0/12=0
1996	11* (use 10)**	4	4/10=40	6	6/10=60	0	0/10=0
1997	12	10	10/12=83.3	2	2/9=22.2	0	0/10=0
1998	12	11	11/12=91.6	1	1/12=8.3	0	0/10=0
1999	12 (use 11)**	10	10/11=90.9	1	1/11=9	0	0/11=0
2000	12 (use 11)**	7	7/11=64	0	0/11=0	4	4/11=36
2001	11* (use 11)**	5	5/10=50	3	3/10=30	2	2/10=20
2002	12	9	9/12=75.0	2	2/12=16.7	1	1/12=8.3
2003	11*	11	11/11=100.0	0	0/11=0.00	0	0/11=0.00
2004	12 (use 11)**	6	6/11=54.5	2	2/11=18.2	3	3/11=27.3
2005	9*(use 8)	7	7/8=87.5	1	1/8=12.5	0	0/8=0
2006	2	1	1 /2=50.0	0	0/2=0	1	1 /2=50.0
2007							
Totals	**152 (use 146)**	**106**	**106/146=72.6**	**29**	**29/146=19.9**	**11**	**11/146=7.5**

Table 2: Annual Program Survey Results

College Choice of Participants					
Year of Participation	**Number of Participants**	**Penn State University**		**Penn State New Kensington**	
	#	#	%	#	%
1993	12	2	2/12=16.7	1	%
1994	12	4	4/12=33.3	1	1 /2=50
1995	12	4	4/12=33.3	1	1 /4=25
1996	11*(use 10)***	2	2/10=20	1***	1 /3=33.3
1997	12	6	6/12=50	2	1 /2=50
1998	12	4	4/10=40	0	2/6=33.3
1999	12 (use 11)**	6	6/11=54.5	1	0/4=0
2000	12 (use 11)**	0	1/11=10	0	1/6=9
2001	11* (use 11)**	4	4/10=40	0	0/1=0
2002	12	4	4/12=33.3	2	0/1=0
2003	11*	4	4/11=36	1	2/4=50.0
2004	12 (use 11)**	2	2/11=18.2	0	1 /4=25.0
2005	9* (use 8)	3	3/7=42.9	0	0/2=0
2006	2	1	1 /0=50.0	0	0/3=0
2007					0/1=0
Totals	**152 (use 146)**	**47**	**47/146=32.2**	**11**	**11/47=23.4**

* Missing participant due to last minute cancellation.
** Participant unable to be reached for comment
*** Deceased, Spring 1998
# Number of Participants
% Percentage of Participants

This study is undertaken every year in an effort to revise the statistical data regarding the former participants who have reached college age.

The 2007 FIRSTE Program Marks Its Fifteenth Consecutive Year

As described in a preceding section, former participants are personally contacted each year upon graduation from high school so as to identify their career plans (i.e. academic major and college/university). But this milestone in 2007 warranted more than the annual telephone call. Given 12 participants per year, the FIRSTE Program has generated potentially 180 college graduates during its 15 years of service. Thus, the program directors, along with its executive board, thought it a timely move to now question those participants who have in fact graduated from college. Admittedly, their myriad of life experiences encountered while in college would naturally diminish the impact of the FIRSTE Program to some extent. Nevertheless, the degrees they earned and the universities they attended make for good information because it pertains to a grouping of students who can all claim the FIRSTE Program as a shared experience while in high school.

The Fifteen Year Questionnaire

In August of 2007, the FIRSTE Program directors developed a mail-out questionnaire which was sent to all participants who could be conceivably deemed college graduates. There were 114 from the program identified as such. Of this number, nearly 100 mailings successfully reached their intended address. The response rate (a respectable one-third) reflected 31 respondents out of 96 confirmed contacts.

The questionnaire mailed to all of the participants is shown in Figure 1.

Figure 1-Sample of 2007 FIRSTE Program Survey

Dear FIRSTE Program Participate,

Some years ago, you were selected to attend the Females Interested in Reaching for Science, Technology and Engineering (FRISTE) Program. As its co-directors, we are interested in what you have chosen to do for your career. Might you take the time to complete the following brief survey? You may detach it at the dotted lines and include it in the self-addressed stamped envelope provided for your convenience. Or, if you choose, you can send your responses via email to the addresses supplied below.

We should mention that the FIRSTE Program ran for its fifteenth consecutive year this past summer. Thanks to funding from dedicated donors such as the Bozzone Foundation, we have been able to continue offering this special program to high school females.

Should you have any questions about this survey or the program, please feel free to contact either one of us. We can be reached at (724)-334-6742, tzb1@psu.edu, for Tracie Brockhoff, or (724-334-6737, jak12@psu.edu for Joan Kowalski.

Sincerely,

Tracie L. Brockhoff

Sincerely,

Joan A. Kowalski

FIRSTE Program (1999) Survey

1. Did you receive a college degree?
   If yes, what was your major (s), and what school(s) did you attend?
   If no, skip to question 2.
2. Are you currently employed?
   If yes, where, and what position do you hold there?

Table 3 contains the responses obtained from the questionnaire in tabulated form. Each column refers to a question shown on the survey. There is a row allotted to each of the respondents, though some of them elected not to supply their name. Several of the participants have advanced to graduate school. This particular information is provided in the columns toward the right edge of the paper. It is interesting to note the variety of professional jobs undertaken by some of the women. These positions include a research specialist in neuroscience, a biotechnologist in stem cell therapies, an environmental water consultant, engineers, science teachers, etc. It is gratifying to know that these accomplished individuals shared common roots in the FIRSTE Program.

Table 3: Results from 2007 Questionnaire

Year of participation	1st School Attended	1st Degree	2nd School Attended	2nd Degree	Current Employer	Job Function/ Location	Comments
2001	Lehigh University	BS Biology	Lehigh University	BA English	Americorps	New Jersey	Will attend medical school in Fall 2008
2001	Penn State University	BS Plastics Engineering			Port Erie Plastics	Process Engineering	
2002	University of Pittsburgh	BS Civil Engineering	University of Pittsburgh		Robert Kimball And Assoc.	Intern, Pittsburgh, PA	Will be starting MS program in Fall 2008
1995	Bucknell University	BE Biology	Gannon University	MA Education	Burrell School District	Middle school Science teacher, Lower Burrell, PA	
2002	Penn State University	BE Mechanical Engineering			Ellwood National Forge	Co-op Position	Disney College Program Cast member
	Penn State University	Be Bioltechnology	University of Manchester	MS	AppTec	Stem cell Therapies, Philadelphia, PA	Starting graduate school in Manchester, England
2002	Indiana University of PA	Be Chemistry (grad 2008)			Transform Pharm, Inc.	Intern	Participated in UCONN Reu 2006 in Chemistry
2002	Penn State University	BE Industrial Engineering (Dec 2007)			NA		
2002	Penn State University	BS Music Education & Minor in Human Development and Family Studies (May 2008)			NA		
2002	St. Mary's College, Notre Dame, IN	MIS and Marketing (May 2008)			St. Mary's College	Student Catering Manager at School, Notre Dame, IN	
2001	University	EMET			Electro-Optics	Intern for Night Vision Lab	
2001	Case Western Reserve University	BA Political Science	University of Pittsburgh	GSPIA			Starting graduate school in Aug 2007
2000	Yale University	Environmental Engineering			Tetra Tech	Environmental Water Consultant	
2000	University of Notre Dame	Biochemistry and Psychology	Philadelphia College and Osteopathic Medicine	D.O. degree			Plan to practice as physician
2000	University of Pittsburgh	BS Psychology and Neuroscience Minor			UPMC	Research Specialist, Clinical Cognitive Neuroscience Lab, Pittsburgh, PA	Studying schizophrenia
2000	University of Pittsburgh	Nursing			UPMC	Children's Hospital Nursing Assistant, Pittsburgh, PA	
1999	Penn State University	Electrical Engineering (2005)			Bechtel Plant Machinery	Electrical Engineering, Monroeville, PA	New address: 240 Nebraska Dr Lower Burrell, PA 15068

Year of Participation	1st School Attended	1st Degree	2nd School Attended	2nd Degree	Current Employer	Job Function	Comments
1999	University of Maryland	Aerospace Engineering			Sikorsky Aircraft Corp	Advanced Concept Engineer, Stratford, CT	
1999		BS Management with Finance Concentration		MSEd in Math Ed	Fredrick Douglas Academy VII HS	Math teacher, grade 10, Algebra and Geometry, Brooklyn, NY	Med in School Admin (in progress)
1998	Penn State University	BS Chemical Engineering			NASA Goddard Space Flight Center	Contamination Control Engineer for Hubble Space Telescope	
1998	Gannon University	BS Electrical Engineering	Penn State University	MBA	GE Transportation	Proposal Leader: Locomotive Renewal Parts, Erie, Pa	New Address: 9288 Williams Rd North East, PA 16428
1998	Juniata College	Chemistry	University of Pennsylvania	PHD candidate Organic Chemistry			
1998	Indiana University of PA	Biology Education			Apollo Ridge School & Indiana School Districts	Substitute Teacher, Apollo, PA	New address: 1253 Rearick Rd, Shelocta, PA 15774-8432
1995	Carnegie Mellon University	Material Science and Engineering	Seton Hill	MBA	Midal Steel	Engineer, Georgetown, SC	
1995	Allegheny College	Psychology Major			Innovation	Director of Inside Sales, Johnson City, NY	Manufactures automated equipment to count and fill prescriptions
1995	Cornell University	Architecture			Robert A.M. Stern	Architect, New York NY	WWW.ramsa.com
1994	St. Francis University	BS Psychology	Indiana University of PA	M Ed School Counseling	Norwin High School	School Counselor, Irwin, PA	
1993	Grove City College	Bio Chem	Le Com Erie	Medical School	US Army		Currently finished residency for family practice. Med school done on Army scholarship
1993	University of Pittsburgh	BA Urban Studies	University of Pittsburgh	Masters Art Teaching	Henrico Cty Public Schools	Elementary school teacher, Richmond, VA	
1993	Ohio Northern University	Pharmacy			Cleveland Clinic	Director of Oncology Out Patient Pharmacy, Cleveland, OH	Director of Oncology Out Patient Pharmacy
1993	California University of PA	BS Psychology	Indiana University of PA	M Ed School Psychology	FBR	Behavioral Specialist Consultant, Monroeville, PA	Your program helped me decide that engineering was not my long term interest

Table 4 summarizes the results of the questionnaire in such a way as to parallel both Tables 1 and 2. In this case, however, Table 4 refers to participants who have graduated from college; whereas, in Tables 1 and 2 they are simply high school graduates. Interestingly, the results from both tables match rather well. For instance, 72.6% of all FIRSTE Program participants who have graduated as of Summer 2007 planned to major in a nontraditional career (i.e. engineering,

engineering technology, science), while 71% of the college graduates who responded to the questionnaire actually did earn such a degree. A discrepancy does appear though regarding the institutions of higher learning. That is, 32.2% of the high school graduates form 2007 selected University. But only 25.8% of the college graduates actually earned their degree from this school. Regardless, the results from the questionnaire are positive considering the underrepresentation of females in the aforementioned fields.

Table 4: Summary of 2007 Questionnaire

	First degree earned		School attended	
	Engr/Engr.Tech/Science	Other	University	Other
Participants	22	9	8	23
Total = 31	22/31=71.0%	9/31=29.0%	8/31=25.8%	23/31=74.2%

Conclusion

Clearly, the FIRSTE Program boasts unusual longevity along with a history of success regarding its effectiveness in encouraging high school females to consider careers in nontraditional areas such as engineering, technology and science. But it was the massive mailing of 2007 which revealed even more information about the former participants by reaching those of them who have earned at least one degree. For throughout college, each one of them extracted some benefit from the FIRSTE Program which contributed to their ultimate success as a professional in the predominately nontraditional fields of engineering, engineering technology engineering-related and sciences.

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