ABSTRACT:
The Discover Engineering Summer Camp, launched in 1991, is a summer day camp that targets students in grades 10 to 12. According to the data from the 2001 camp, 98% of the participants indicated that the camp increased their knowledge about engineering, and 94% indicated that the camp increased their interest in considering engineering as a career option. This paper discusses activities that have been effective in educating young women about the challenges and rewards of engineering careers, that have shown engineering to be a viable profession to consider, and have motivated many of the young women to choose engineering educational and career paths. It also discusses information collected from the young women regarding their future career choices, shows how they ranked the importance of various career factors such as ‘lifestyle’, ‘salary’ and ‘challenge’, and compares how the students heading towards engineering ranked the various career factors versus the other students.

KEY WORDS: Women in Engineering, High School Outreach

INTRODUCTION
Statistics from 1998/1999 (the most recent statistics available) indicate that 55% of students enrolled in Canadian universities were women [1,2] yet only 19.5% of students enrolled in engineering programs were women [3,4].

The engineering profession has not been as successful in attracting women as other previously male-dominated fields such as law or medicine [5]. While the percentage of women engineering students has increased from less than 5% (1975) to almost 20% (1998) the profession itself still lags behind. In province of Ontario only 3,030 women (4.9%) were registered as Professional Engineers (P.Eng.) in 1998, with a similar national average [5].

While the climate for women in engineering has been slowly changing over the years, lack of encouragement, peer pressure and other factors still act as barriers preventing more women from pursuing a career in this non-traditional field [3].

FACTORS AFFECTING YOUNG WOMEN’S CHOICE OF ENGINEERING AS A CAREER

In Ontario, the PEO and others have frequently commented on the low level of general knowledge about engineering, the image of the profession and its status [6].

Our research focused on two factors affecting young women’s choice of engineering as a future career; knowledge about engineering at the high school level and awareness of potential careers in engineering.

Background: Discover Engineering Summer Camp

The Discover Engineering Summer Camp was established in 1991 by Ryerson’s Women in Engineering (WIE) Committee and is supported by the Office of the Dean of Engineering and industry partners. The primary objective of the program was to introduce young women in high school to the challenges and rewards of engineering through a variety of fun, hands-on activities and discussions led by women engineers, scientists and students.

Female students who have completed grade 10 comprise the target audience; however, girls who have completed grades 9 through 13 are also welcome. Although the students have usually already chosen to continue with the math/science stream in high school, they have not necessarily decided on a career path. Unlike some other science and engineering programs for youth, Discover Engineering is delivered exclusively to women. The overall goal of the program is to increase awareness among these students about careers in non-traditional areas of applied science at a time when decisions about post-secondary education is at the forefront of their minds.

The Discover Engineering Summer Camp is a week-long day camp based on hands-on activities in a stimulating learning environment, which allow young women to achieve success by working on comprehensive engineering projects in a variety of
engineering fields. Camp counsellors, who are female undergraduate engineering students, guide the participants throughout the week as they attend various sessions taught by female professors, staff, alumni and engineering students.

The main objective of the Discover Engineering camp is to provide education to young women about engineering and to show them that it can be a viable career choice. This objective is achieved through involvement in hands-on activities, exposure to women engineering students, instruction by women science and engineering faculty and staff and panel discussions with professional engineers who are female.

Students Participating in Study

Students participating in this study were Discover Engineering Summer Camp participants during the August 2001 camp sessions.

Fifty-seven students participated in the pre-camp questionnaire. The majority (42%) of the students had just completed Grade 11 and the grade distribution chart is shown in Figure 1.

Knowledge of engineering at the high school level

According to our pre-camp questionnaire, only 40% of the camp participants had previous knowledge about engineering. Of these students, 22% learned about engineering from Ryerson’s Discover Engineering Career Conference [7], 22% learned about engineering from a program sponsored by another university and 56% learned about engineering from another source (high school projects, parents, etc.).

98% of the students indicated that camp increased their knowledge about engineering.

94% of the students indicated that camp increased their interest in pursuing engineering as a career.

Figure 1: Grade Distribution of Participants

CAMP ACTIVITIES INFLUENCING CAREER CHOICE

Hands-on activities

A variety of activities throughout the week are designed to expose students to elements related to a variety of engineering disciplines including: Mechanical, Civil, Chemical, Aerospace, Electrical, Computer, and Industrial Engineering. Camp sessions are scheduled in three-hour time slots to allow the participants to explore and ask questions. The material presented is relatively challenging but not overwhelming. All camp activities emphasize participation and collaboration. The socializing aspect of the camp is very important, as often this is the first opportunity for teenage girls with interest in sciences and engineering to meet a large number of like-minded peers [5].

Panel Speakers

The Panel Speaker Session, held on the final day of each camp session, offers an opportunity for the students to meet women engineers representing a wide variety of experience and career paths. A panel of 3 to 4 women participate, and share details of their own academic history and experiences. They describe their current jobs, and highlight aspects of the engineering profession that makes it viable and rewarding for them [5]. A question and answer session follows. This session is often noted as the highlight of the week’s events, and when asked how the Discover Engineering program can be improved, students often request “more panel sessions”.

CAREER FACTORS INFLUENCING CAREER CHOICE

The pre- and post-camp surveys for the 2001 Discover Engineering Summer Camp included questions about career direction and the importance of various factors in choice of future career.

The students were given a choice of the following careers: Architecture, Arts, Business, Computers/E-business, Engineering, Health/Medicine, Law/Social Sciences, Pure Science, Pure Math, Teaching/Education, Not Sure, Other.

The students were asked to choose one career as their ‘current career direction’ prior to attending the summer camp, and at the completion of the camp they had an opportunity to revise or maintain their career selection. Students who changed their career
selection were given an opportunity to explain what influenced their decision to change.

As shown in Figure 2, the students chose the following careers in order of preference; Engineering (33%), Health/Medicine (16%), Computers/e-Business (9%), Pure Science (5%), Other (5%), Architecture (2%) and Pure Math (2%). A large portion (28%) of the students were ‘not sure’, and a number of career choices were not selected by any students.

Figure 3 shows that prior to attending the summer camp, 33% of the students chose engineering as their current career direction, and this value increased to 58% after attending the camp.

Many reasons for changing to ‘engineering’ were cited by the students including: increased awareness of future career opportunities, increased knowledge about the engineering profession itself, and being inspired by the women in engineering (panel speakers).

Importance of various career factors

Our study investigated how the high school students felt about various career factors such as ‘image’, ‘opportunity for advancement’, ‘challenge’, etc. We asked the students to rank the career factors from most important (#1) to least important (#7). A weighted average was used to determine the final ranking of the career factors from most important to least important. For their most important (#1) and least important (#7) choices, students were given an opportunity to explain their selection.

Our study compared how the students selecting ‘engineering’ as their career direction ranked the various career factors versus the other students, specifically the students who were undecided or ‘not sure’ about their career direction.

The students who selected ‘engineering’ as their current career direction considered ‘challenge’ the most important factor in their future career, followed (in order) by ‘salary’, ‘employment opportunities’, ‘opportunities for advancement’, ‘working environment’, ‘lifestyle’ and lastly ‘image’, Figure 4.

The students who were undecided or ‘not sure’ considered ‘working environment’ the most important factor in their future career, followed (in order) by ‘lifestyle’, ‘challenge’, ‘opportunities for advancement’, ‘employment opportunities’, ‘salary’ and lastly ‘image’, Figure 4.
goals, and needing a career that was “challenging & interesting & different”.

Salary

Salary was ranked as the #2 career factor by the ‘engineering’ students, yet was ranked much lower (#6) by the ‘not sure’ students.

Employment Opportunity

‘Engineering’ students ranked employment opportunities as their #3 career factor, yet this was ranked as #5 for the ‘not sure’ students. One ‘engineering’ student, who ranked employment opportunities #1, noted that the employment opportunity is important so that she may pursue a career in which there are many job openings/opportunities for success.

Opportunity for Advancement

Opportunity for Advancement was ranked #4, or neutral in importance, by both the ‘engineering’ students and the ‘not sure’ students.

Working Environment

Although working environment was ranked quite low (#5) for the ‘engineering students’, it was ranked as the most important career factor for the undecided or “not sure” students, with 60% of them ranking this career factor #1 or #2.

Many of the ‘not sure’ students noted that a good working environment is required to work effectively, to stay content, and they wish to work with people who care about and respect their values.

Lifestyle

As with working environment, lifestyle was also ranked very low (#6) by the ‘engineering students’ yet very important (#2) to the ‘not sure’ students.

Image

Image was viewed as the least important career factor by both the ‘engineering’ students and the ‘not sure’ students. Both groups of students felt that image is not that important and that it is much more important to enjoy what you do.

CONCLUSIONS

Since almost all of the students participating indicated that Discover Engineering increased their knowledge about engineering, and more importantly their interest in pursuing engineering as a career, it reinforces the need to provide information about engineering at the high school level.

The engineering profession and post-secondary institutions need to continue to assist the high schools in providing information regarding career opportunities in engineering. As proven by the popularity of the Discover Engineering Panel Speaker sessions, this is best accomplished by interaction between high school students and professional engineers as panel speakers or instructors.

When promoting engineering careers, a number of factors should be emphasized. Not only should the engineering profession be promoting factors such as the challenge of the work and the earning potential of engineering careers, but career factors such as a positive work environment and achieving a balanced lifestyle should be pursued in order to appeal to a broader range of students.

REFERENCES