



International Journal of Gender, Science and Technology

<http://genderandset.open.ac.uk>

Evaluation of the *Engineer Your Life* Initiative

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ABSTRACT

The *Engineer Your Life* (EYL) project is a national initiative to encourage college-bound young women to consider pursuing a degree and a career in engineering. The project aims to communicate to young women the societal value and rewards of being an engineer, rather than the traditional emphasis on the process of becoming an engineer. Target audiences include academically prepared high school girls, career counselors, and professional engineers. Evaluation data were collected in Year 1 and Year 2 of the EYL initiative to assess its impact. We found that young women were especially interested in engineering when they had a fuller understanding of the skills that are required to be a successful engineer—skills that are not traditionally associated with the field, such as writing and people skills, imagination and creativity. We also found evidence that the EYL initiative has had a significant and positive impact on members of its target population who have used EYL resources.

KEYWORDS

Gender; engineering; impact evaluation.



Evaluation of the *Engineer Your Life* Initiative

BACKGROUND AND RELEVANCE

According to the Bureau of Labor Statistics, four of the thirty fastest growing occupations through to the year 2018 will be in engineering-related fields, resulting in over 386,000 new job openings.¹ However, many students are graduating from high school with insufficient skills to pursue engineering.² Furthermore, male students vastly outnumber female students in undergraduate engineering programs. For example, in 2002, only 20% of engineering undergraduate degrees were completed by women³ and in 2005, 52,936 men graduated college with an engineering degree, while only 13,197 women did the same.⁴

Therefore, in an effort to prepare female high school students for a college curriculum and achieve gender parity in the engineering industry, WGBH⁵ has developed an initiative entitled, *Engineer Your Life* (EYL). The initiative is targeted toward female high school students, career counselors, and professional engineers. It is designed to: 1) increase these target audiences' understanding of engineering; 2) inspire young women to explore engineering as a career option; and, 3) help counselors and engineers encourage young women to investigate engineering opportunities.

The EYL Initiative

The *Engineer Your Life* (EYL) project, with funding from the National Science Foundation (NSF) (Grant No: NSF 0550710), is a national initiative to encourage college-bound young women to consider pursuing a degree and subsequent career in engineering. The American Association of Engineering Societies (AAES), the American Society of Civil Engineers (ASCE), the National Engineers Week Foundation (Eweek), and the WGBH Educational Foundation are leading a coalition of 105 engineering organizations in an effort to reposition engineering as a creative, collaborative, lucrative, and flexible career choice.

The goal of the EYL project is to encourage academically prepared high school young women to consider engineering as an attractive option for post-secondary education and subsequent careers in order to increase the

number of women who make up the engineering workforce. The project aims to fundamentally shift the way the engineering and educational communities portray engineering. Based on a needs assessment⁶ performed in 2004, the EYL coalition embraces a communication strategy that focuses on the societal value and rewards of being an engineer, as opposed to the traditional emphasis on the process and challenges of becoming an engineer.

Since 2008, EYL coalition activities have included the following:

Hosting an EYL Table at College Fairs

During the 2007-09 academic years, EYL attended 52 fairs, reaching 15,000+students. Also, EYL has hosted booths at CollegeWeekLive, a virtual college fair. Over 1,200 students visited the EYL booth.

EYL Trainings and Webinars

The EYL coalition hosted workshops for 390 participants at annual meetings of the National Science Teachers' Association (NSTA); Northrop Grumman Long Beach (NG Long Beach); and, National Society of Black Engineers (NSBE), including NSBE Junior Chapter members. The EYL coalition have also carried out training for NSBE Junior Leaders; International Technology Education Association (ITEA); National Afterschool Association (NAA); American Society of Engineering Education (ASEE); Women in Engineering Pro-Active Network (WEPAN); and, the Connecticut chapter of the National Girls Collaborative Project (NGCP). The coalition also conducted six webinars, reaching a combined total of approximately 495 participants.

Linking to the EYL Website

In the fall of 2008, efforts began focusing on encouraging coalition members to link to the EYL website (<http://engineeryourlife.org>). These relationships and linkages were important as websites that link to EYL account for 43% of the site's traffic. As of summer 2009, 180 organizations, including 23 coalition members, were linked to EYL. In addition, 24 blogs and newspapers linked to EYL.

Reaching Young Women and their Parents

The coalition has been employing a multi-prong strategy to build awareness about EYL, including direct mail, press releases, online promotion, booths at college fairs, workshops, and the efforts of coalition partners.

Facebook

The coalition built six fan pages that are a blend of 'official' and 'shared interest' pages to help grow its 'fan base' and give fans a chance to interact with the coalition by posting comments and photos. The six EYL pages currently have over 16,000 total fans.

Banner Ads

Supplementing the Facebook campaign are banner ads. The coalition purchased advertising space on US News & World Report, NSTA, and the National Council of Teachers of Mathematics. It also negotiated with a media buying service to purchase a number of banner ads on 150 different sites that attract women, parents, and teachers.

Google Adwords

In May, the coalition launched several different ads and the campaign has led to over 8,000 clicks to the EYL website.

Growing the Coalition

In February 2008, there were 55 members of the coalition. To date, there are 105 members.

STUDY DESIGN

To evaluate the impact of the EYL initiative, WGBH hired independent research firms, American Institutes for Research (AIR) and Veridian inSight (VI).⁷ In Year 1 (2008) American Institutes for Research (AIR) collected baseline survey data to inform the development of the EYL initiative and set the foundation to measure its effectiveness over time. In 2009, Veridian inSight (VI) collected Year 2 survey and interview data. Year 3 data collection is currently underway. Table 1 summarizes the type and frequency of data collection for the evaluation.

Table 1: EYL Evaluation Data

Type of Data	Year 1 (2008)	Year 2 (2009)	Year 3 (2010)
Survey of career counselors	X	X	X
Survey of engineers	X	X	X
Survey of college-bound, female high-school students	X	X	X
Interviews with EYL partners		X	X

The study was designed to capture data over a period of three years from the three main cohorts of interest: professional engineers, career counselors, and college-bound female students. The study was *not* designed to be a longitudinal study of the same individuals over time. Rather, the surveys will capture data from unique members of each cohort over time. These data provide a 'snapshot' of attitudes, knowledge and beliefs among key audiences at three points in time: before the EYL initiative was launched, the year of its launch, and one year after EYL was launched.

Study Participants

To date, the study sample has included counselors, teachers, engineers, and college-bound female students from all regions of the United States and a small sample from Canada. The total number of participants is summarized in Table 2 below. We should note that the samples are independent from Year 1 to Year 2; in other words, we only included individuals in Year 2 who had *not* responded to the survey in Year 1.

We recruited survey respondents through contacts at relevant organizations and associations. Individuals who received the recruitment advertisements circulated the information via listserv postings, electronic bulletin boards, word-of-mouth, flyers and emails to all of their members. The organizations included national engineering, counselor and teacher associations, and national organizations for girls and young women. We also invited individuals who previously visited WGBH at college fairs and visited the EYL website. We targeted college-bound, female high school

students by posting advertisements on social networking websites and various teen / student online forums. We also targeted counselors and engineers by posting advertisements on professional networking websites.

Table 2: Number of Study Participants

Role	Year 1 Frequency & Percentage	Year 2 Frequency & Percentage
Counselor Survey		
Counselor only	147 (100.0%)	101 (59.1%)
Counselor and teacher	0 (0.0%)	43 (25.1%)
Teacher only	0 (0.0%)	27 (15.8%)
Engineer Survey		
Engineers	401 (100%)	411 (100%)
Student Survey		
College-bound, female students	1,824 (100%)	707 (100%)

PROGRAM IMPACT

The balance of this paper summarizes our key evaluation findings with respect to EYL impact to date.

Girls who visit the EYL website report becoming more interested in engineering and feeling inspired to pursue engineering in college.

107 of the student respondents had used the EYL website⁸, and of that 107 most indicated that the website helped them learn about engineering (95.3%). Most students also indicated that the website made them become more interested in engineering as a career (87.9%) and inspired them to take an engineering class in college (75.5%).

Students' favorite aspects of the site were: learning about different engineering jobs, the stories about women engineers, and getting information on how to become an engineer.

In addition, many students indicated that the website helped them understand what they should do if they wanted to become engineers (79.2%). Most also reported that they would recommend the website to their friends (91.5%).

EYL appears to be helping students to understand that engineering encompasses a wide range of skills.

Data analysis was carried out using chi-square analysis⁹. Over time, it appears that many students are becoming more familiar with the skills needed to become engineers. For example, students in Year 2 were significantly *more likely* than students in Year 1 to believe that engineers needed the following skills:

- Good problem solving skills ($\chi^2_{(df=1)} = 13.022, p = 0.000$)
- Ability in math ($\chi^2_{(df=1)} = 15.005, p = 0.000$)
- Ability in science ($\chi^2_{(df=1)} = 18.428, p = 0.000$)
- Imagination and creativity ($\chi^2_{(df=1)} = 55.408, p = 0.000$)
- Good people skills ($\chi^2_{(df=1)} = 34.953, p = 0.000$)
- Good writing skills ($\chi^2_{(df=1)} = 25.245, p = 0.000$)
- Good public speaking skills ($\chi^2_{(df=1)} = 32.633, p = 0.000$)
- Ability to work in groups ($\chi^2_{(df=1)} = 5.737, p = 0.017$)

Furthermore, students who were familiar with EYL were significantly *more likely* than those students who were unfamiliar with EYL to believe that the following skills were important to engineers¹⁰:

- Imagination and creativity ($\chi^2_{(df=2)} = 6.755, p = 0.034$)
- Good people skills ($\chi^2_{(df=2)} = 7.424, p = 0.024$)
- Good writing skills ($\chi^2_{(df=2)} = 10.274, p = 0.006$)
- Good public speaking skills ($\chi^2_{(df=2)} = 10.120, p = 0.006$)

We also asked students to tell us the job roles they associate with engineering careers. Students who were familiar with EYL were significantly *more likely* to associate the following non-stereotypical job roles with engineers than students who were unfamiliar with EYL:

- Using their math and science skills (90.8% in Year 2 versus 85.9% in Year 1)
- Thinking creatively (82.9% versus 68.6%)
- Inventing things (78.1% versus 37.3%)
- Making a difference in people's lives (77.2% versus 58.6%)
- Sometimes working with other professions (76.8% versus 70.7%)
- Working as part of a team (76.4% versus 67.2%)
- Having a lot of choices in the industry (73.7% versus 64.0%)
- Using English and writing skills (29.1% versus 18.3%)

EYL may be filling an information gap for counselors at schools with few engineering resources.

Counselors who had previously heard of EYL were far more likely to be from schools that did *not* offer specific engineering classes ($\chi^2_{(df=2)} = 5.696$, $p = 0.017$) *nor* did their schools offer engineering in their science curricula ($\chi^2_{(df=2)} = 3.999$, $p = 0.046$). For example, of the counselors who indicated they were familiar with EYL, 86% of them were from schools that did not offer specific engineering classes. Thus, it appears that counselors in such schools may be more actively seeking out information on engineering from external sources than counselors in schools that already offer such courses.

Moreover, counselors who reported they had heard of EYL were more likely to be from schools that did not offer engineering classes ($\chi^2_{(df=2)} = 5.090$, $p = 0.024$). Thus, it appears that the EYL resources are perceived by counselors in schools without their own engineering resources to be able to fill an important gap in engineering resources.

Counselors are using EYL resources to help educate students about the engineering field.

It appears that the EYL resources are indeed being used to educate women who career counselors believe need more information about the field. For instance, counselors who used EYL resources were also more likely to report that “young women are not aware of what engineers do” than counselors who did not use EYL resources ($\chi^2_{(df=1)} = 4.051$, $p = 0.045$). Counselors who used EYL resources were also more likely to report that “engineering has a masculine image” than counselors who did not use EYL resources ($\chi^2_{(df=1)} = 3.870$, $p = 0.049$). Some counselors reported:

- “Being from Michigan, my girls often associate engineering with the automotive industry. The site was useful in opening their minds to the other possibilities.”
- “This (EYL) helped me to find an appropriate school for a student interested in bioengineering and biomedical engineering.”

The EYL website has helped counselors learn more about engineering and how to prepare young women to pursue it.

99% of counselors who were familiar with EYL reported that they learned something about engineering using the EYL website.

Most of the counselors (96%) also reported that the website did a good job of helping them understand what they should do to prepare female high school students to become engineers (e.g., what classes to take and how to prepare for college).

96% of counselors reported that the website did a good job of showing what life and work are like for different engineers.

All the counselors reported that the website helps to teach young people about engineering, that it helps young people understand that an engineering career is achievable, and that it does a successful job of introducing female high school students to young women engineers.

All counselors reported that they would visit the website again and recommend the website to others, including other counselors and students.

Engineers report that the EYL website portrays engineering in a realistic, understandable, and educational way and helps them to prepare young women for becoming engineers.

All of the engineers who had used the website (N = 103)¹¹ reported that the website did a good job of showing what life and work were like for engineers.

Most engineers (88%) reported that the website helped them to feel more comfortable helping to prepare female high school students for becoming engineers.

Almost all of the engineers (97%) reported that the website helped young people learn about engineering and that it did a successful job of introducing female high school students to female engineers.

All of the engineers reported that the website helped young people understand that an engineering career is achievable.

All of the engineers indicated that they would recommend the website to a student who is interested in learning more about engineering. Most engineers (97%) reported that they would recommend the website to their colleagues.

Some comments added by engineers included:

- "I love the positive image of engineers (specific engineers with faces) really making a difference (specific differences with pictures/videos)! I also really like the easy to access descriptions of the various types of engineering."
- "I think it is great that there is a website encouraging young girls to become engineers."
- "The teachers and counselors that I have worked with are especially excited about the stories and videos!"
- "The videos help younger children understand what an engineer does."

CONCLUSION

This study found that academically-prepared young women expressed a definite interest in using math and science in their future careers and that they expressed significant interest in doing the kinds of work that engineers do. Students were even more interested in engineering when they had a fuller understanding of the kinds of skills that are required to be a successful engineer—skills that are not traditionally associated with the field, such as writing and people skills, imagination and creativity. This deeper understanding is one of the changes that EYL strives to produce.

So, what role has EYL played in this shift? Our study found evidence that the *Engineer Your Life* initiative has had a significant and positive impact on members of its target population who have used EYL resources. Young women who visited the EYL website reported becoming more interested in engineering and feeling inspired to pursue engineering in college. EYL also appeared to help students to understand that engineering encompasses a wide range of skills. In addition, EYL appeared to fill an information gap for counselors at schools with few engineering resources. Counselors reported

that they used EYL resources to help educate students about the engineering field and that the EYL website helped them learn more about engineering and how to prepare young women to pursue it. Finally, engineers reported that the EYL website portrayed engineering in a realistic, understandable, and educational way and helped them prepare girls for becoming engineers.

Of course, more work remains to be done. According to the counselors and the engineers in our survey, there are still significant barriers to women entering the field of engineering and male engineering graduates continue to vastly outnumber female engineering graduates. More than half of the counselors reported that there were several barriers to women entering the field of engineering including a lack of female role models; women being unaware of what engineers do; the masculine image associated with engineering; and, aversion to working in a male-dominated environment.

Among engineers, the most commonly reported barrier was young women's lack of familiarity with the engineering industry. Other key barriers reported by engineers included: a lack of visible role models, the perception of having to work in a male-dominated environment and being the 'lone woman', and the masculine image of engineering.

The EYL initiative will continue to attempt to mitigate these barriers through its current outreach and educational efforts and has plans to expand to a greater number of partners in the future, including the development of model programs at universities and colleges around the US.

ENDNOTES

¹ Bureau of Labor Statistics, U.S. Department of Labor (2010) *Occupational Outlook Handbook, 2010-11 Edition, Engineers*, [online], Available from: <http://www.bls.gov/oco/ocos027.htm> (Accessed 10 May 2010)

² Weill, S.I. (2008) 'High schools focus on engineering', *Industrial Engineer*, Vol. 40(1), pp. 16.

³ National Science Board. (2008) *Science and Engineering Indicators*, [online] Available from <http://www.nsf.gov/statistics/seind08/> (Accessed 2 January 2010)

⁴ National Science Foundation. (2008) *Women, Minorities, and Persons with Disabilities in Science and Engineering*, [online] Available from <http://www.nsf.gov/statistics/wmpd/degrees.cfm> (Accessed 5 May 2008)

⁵ These are television station call letters. In the US all radio and TV stations have four digit call letters to identify them.

⁶ Extraordinary Women Engineers Coalition (2005) *The Extraordinary Women Engineers Final Report*, WGBH: Boston, MA

⁷ Veridian inSight is now named Concord Evaluation Group.

⁸ This represents 15% of the total student sample.

⁹ We performed chi-square analyses using SPSS statistical software to test the hypothesis that the proportion of students who listed these skills was different between Year 1 and Year 2. The null hypothesis states that there is no difference between students in Year 1 and Year 2. A "p-value" of less than .05 indicates that the null hypothesis was rejected and the differences between Year 1 and Year 2 were indeed statistically significant. A p-value of less than .05 means that it is highly unlikely that the differences between Year 1 and Year 2 are due to chance.

¹⁰ Here, we tested the differences between students who were unfamiliar with EYL, students who were familiar with EYL and students who indicated that they were unsure whether they knew about EYL.

¹¹ This represents 25% of the total engineer sample.