



D-E Communications - Critical Issues Series

Improving Engineering's Public Image – Ten Guiding Principles

Engineers Dedicated to a Better Tomorrow (*DedicatedEngineers*) is a non-profit dedicated to advancing the engineering profession. PO Box 2486, Menlo Park, CA 94026 • (650) 323-8452 • info@DedicatedEngineers.org • www.DedicatedEngineers.org

The Critical Issues Series (CIS) consists of short, to-the-point documents, each addressing a single identified issue of importance. These documents are intended to stir discussion and/or action within the engineering community. We welcome your feedback via CIS@DedicatedEngineers.org. Copies of all CIS documents are maintained on our website at www.DedicatedEngineers.org.

As outlined in the Appendix to this paper, the engineering profession has a relatively poor public image, one that handicaps pre-college student recruitment efforts, including recruitment of women and minorities. In dealing with public image problems in general, it is just as important to accurately gauge/recognize what one's current image actually is (being key to effectively counteracting existing misconceptions through "setting-the-record-straight"-type activities) as it is to formulate a desired new image. This paper sets forth the current public image of engineering, followed by a 10-point set of principles for use in establishing a "new and improved" image of engineering and engineers, one designed to be particularly compelling in regards to attracting pre-college students to engineering studies and careers.

Engineering's Current Public Image: All Over the Map

Ask the average "man on the street" what an engineer does and – assuming he/she doesn't personally know an engineer – the first reaction you'll likely get is a pause, followed by either an admission of ignorance or a half-assured response typically asserting that an engineer is one of the following:

1. **Locomotive Train Operator:** The oldest surviving image of engineers and still a surprisingly persistent view, given this day and age. Its continuing persistence (as well as its historical root) is reflected in Webster's dictionary, which still cites "engine operator" as the second (alternative) definition for "engineer" (the first definition being, "one trained in engineering").
2. **Mechanic/Technician:** Building upon the "engine operator" image, as reinforced by the "Scotty" character appearing on the popular and long-running Star-Trek TV/movie series, the mechanic/technician image of engineers is also reinforced today by the prevalent real-world use of the generic titles/position descriptions "maintenance engineer" and "engineering technician."
3. **Construction Manager/Supervisor:** This image of engineers is grounded in the belief that architects (or generic "designers" or "planners") are responsible for putting together the complete design for buildings or other structures, while engineers are the ones who carry out that design – managing the overall construction process and/or directly supervising construction workers.
4. **NASA Flight Control Personnel:** Reinforced by a flurry of Hollywood movies in the late 1990s that focused on the U.S. Apollo space flight program, engineers are viewed to be the flight control (or other ground support) personnel guiding/supporting space flights.
5. **"Computer Person":** This image includes anyone working in a position that is computer operation-focused - computer programmers, software installers/troubleshooters, hardware maintenance personnel, mainframe/systems administrators, etc. (On the other hand, however, the design and manufacture of computers themselves – i.e., hardware engineering – is not necessarily associated by the public to be part of the realm of engineers.)
6. **"Dot-Commer":** Building upon the "computer person" image, the rise of the Internet in the form of the "Dot-Com" craze extended the image of engineers to include persons involved in anything technical that has to do with the Internet, whether in terms of building or operating it.

Given the historical lack of a clearly defined public image of engineers and engineering, it is understandable to see how each of these alternative images has entered through the existing vacuum into the public's mind.

In addressing these images, it is important to note two things about them:

- **They tend to associate engineers with being simple builders, operators, or maintainers and not the designers, creators, and inventors that they are.** This is particularly worrisome given that design represents the heart of engineering, and design's attendant creative and inventive aspects are often particularly attractive to pre-college students.
- **The more recently established images of engineering involve engineers working exclusively on computers/computer systems.** While of course many such computer engineers do exist, such images do not capture the much broader range of opportunities available in engineering, opportunities that can appeal to a wider range of pre-college students.

In addition to misconceptions over what engineers do, there are two other key image concerns that need to be acknowledged and addressed, particularly with pre-college students, namely that engineering is:

- **A White-Male Dominated Field:** While significant strides have been made in this regard, this image remains accurate – recent figures indicate that only about 20% (one-in-five) of engineering students graduating with Bachelor’s degrees are women, while about 33% (one-in-three) are non-Caucasians. In addressing this issue with pre-college students, it is critical to point out both the availability of resources (financial and otherwise) and the existence of organizations specifically devoted to aiding women and minorities pursuing engineering studies and careers – thereby providing reassurance to students that they need not feel that they have to “go it alone” if they choose an engineering career path. (Note: An Internet gateway for accessing such resources and organizations is provided on the [DedicatedEngineers’ website](#).)
- **A Career For “Geeks/Nerds” Only:** Engineers are often stereotyped as geeks and/or nerds – a stereotype embodied in the lead character of the popular “Dilbert” comic strip. Such stereotypes can be effectively counteracted by putting forth real-world role models such as those identified through National Engineers Week’s “New Faces of Engineering” program (see www.eweek.org). In addition, by piggybacking on the image of scientists – as discussed in the next section – a much more compelling image of engineers can be portrayed to both pre-college students and the general public.

A New, More Compelling Image: Piggybacking on the Image of Scientists and Emphasizing Design, Creativity/Inventiveness, Job Satisfaction & Real-World Impact

By failing to effectively establish an alternative vision, the inaccurate/incomplete images of engineering and engineers noted above have been – and continue to be – perpetuated.

To rectify this situation, we offer the following 10-point set of principles for use in establishing a “new and improved” image for engineering and engineers, one that is designed to be particularly compelling in regards to attracting pre-college students to engineering studies and careers:

- 1) **Define engineering as “applied science” and/or “the practical application of science” and an engineer as being an “applied scientist”:** Engineers have traditionally abhorred the use of the term “applied scientist” in describing themselves, seeking instead to establish their own unique identity. However, not only is this description technically accurate, it also serves to establish a highly desirable direct link with scientists, who are held in the highest esteem in the eyes of the general public (ranking #1 in perceived prestige amongst 22 occupations in the latest [Harris public opinion poll](#), while engineers are ranked #9 – see the Appendix for details). At the same time, a clear and simple distinction should be made that while scientists primarily seek to produce knowledge and theory, engineers seek to apply such knowledge and theory to real-world applications to create things – products, systems, structures/buildings, machines, technology, etc.
- 2) **Use “Engineers: Turning Science Into Reality” as a compelling and catchy tag-line:** This is a slight twist on the “Engineers: Turning Ideas Into Reality” theme that has been used by the National Engineers Week program for a number of years. Substitution of the word “science” for “ideas” is put forth as an effective means to reinforce the “applied scientist” label and “practical application of science” definition cited above, again providing a highly desirable direct link to science/scientists.
- 3) **Focus on engineers’ specific and tangible contributions to society and in bettering local communities, our nation and the world:** We look to do so at DedicatedEngineers because it works in grabbing (and retaining) people’s attention! From everyday things (such as clean water and paved roads) to the latest in cutting-edge technology (such as biotechnology and nanotechnology), making the connection back to engineers serves to vividly highlight the critical importance of engineers/engineering to pre-college students as well as to the general public. A desirable “wow” reaction can often be gained by simply pointing out the engineer’s “invisible hand” in almost everything that the general public uses and depends upon each and every day – their house, car, computer, cell phone, etc.
- 4) **Tie in engineers as being the creative hand behind technology – both “high tech” and “everyday tech”:** The general public – especially the younger generation – is fascinated with technology, whether in the form of high-tech applications/products that they may or may not actually use/depend upon (an MRI, GPS systems, etc.), or in the more “everyday technology” form that they likely do use/depend upon (cell phones, home computers, etc.). Thus, tying in the engineer’s critical role in terms of bringing both types of technologies to life can serve to spark additional student interest in engineering, while also raising public appreciation for the efforts of engineers.
- 5) **Emphasize design, creativity, and inventiveness as lying at the heart of engineering:** As noted in the first section, current images of engineers tend to focus on them performing various operation and maintenance (O&M)-type activities. Such images do not convey the fundamental design aspect that serves as the true heart of engineering, nor the creativity/inventiveness aspects associated with the design process. By emphasizing engineers as creators, rather than just simple builders, operators, or maintainers, a higher level of prestige will be associated with the profession by the public as well as higher interest shown by more pre-college students in pursuing engineering careers.

- 6) **Emphasize the work and backgrounds of real, everyday engineers:** A model example is the “New Faces of Engineering” program run in conjunction with National Engineers Week (see www.eweek.org). Such real-world examples can be used to combat the “nerd/geek” stereotype noted in the first section, while also illustrating to pre-college students the wide range of opportunities available to engineers in the real world. [While it would also be highly desirable to highlight individuals already well-known to the public as well, potential candidates unfortunately fall into one of two non-ideal groups: 1) people trained as engineers, but famous for something other than their engineering achievements (for example, ex-President Jimmy Carter) or 2) well-known, but non-ideal role models (Dilbert the comic strip character, Scotty from Star-Trek fame, etc.)]
- 7) **Pose better career-interest questions to pre-college students, ones that spark an interest in engineering, rather than potentially serving to immediately close doors** – for example:
 - a. Not “Do you like to solve problems?” but rather “Would you like to solve practical, real-world problems (like x, y, and z)?”
 - b. Not “Do you like math and science?” but rather “Would you like to use math and science to improve the world and create/invent new things (like x, y, and z)?”
 - c. Not “Do you like to take things apart?” but rather “Would you like to know how things work (like x, y, and z) and use that knowledge to make them work ‘better, cheaper, and faster’ – the engineer’s motto?”
- 8) **Make positive, specific connections to other, more well-known professions when discussing engineering** – for example:
 - a. “Much like an architect designs new buildings, engineers design all kinds of things – roads, bridges, cars, fire-fighting equipment, computers, power plants, medical equipment, airplanes, even sports equipment – and the list goes on and on!”
 - b. “Engineers are like medical doctors in that they both are ‘applied scientists.’ Doctors apply their specialized knowledge of science (primarily biology and chemistry) to diagnose and treat their patients, while engineers likewise use their specialized knowledge of science (primarily physics and chemistry) to design all kinds of useful and important things - including the sophisticated medical equipment and instruments that doctors use on a daily basis to help diagnosis and treat their patients, as well as the pharmaceutical manufacturing plants that produce the drugs that doctors prescribe to help their patients.”
 - c. “Not only do engineers turn scientists’ knowledge into practical, real-world creations, but they also design (and help build) the sophisticated research equipment and instruments that scientists need and depend upon to make their scientific discoveries.”
- 9) **Highlight to pre-college students the high job satisfaction (and underlying passion) amongst practicing engineers:** In these days when general job dissatisfaction is at record levels, even within highly prestigious professions such as law and medicine, the continuing high job satisfaction rate amongst engineers – reflective of an underlying passion that engineers have for their work, just as many scientists do – should be used as a compelling career selling point to pre-college students.
- 10) **Point out the profession’s emphasis on teamwork to pre-college students:** One important distinction separating engineering from many other professions/occupations is the amount of teamwork typically involved/required. This sometimes overlooked, but unique aspect, should be stressed to pre-college students, highlighting the benefits of working in teams. (The teamwork aspect can also be used to explain to students why there is a relative lack of famous engineers in the world – because engineering is a uniquely team-oriented profession!)

In Conclusion

In discussing the declining level of student interest in pursuing engineering careers that his organization had documented, Richard J. Noeth, Director of Policy Research for the academic testing firm ACT, stated, “It (engineering) should be a very attractive and popular field of study for today's top high school students. Unfortunately, that doesn't appear to be the case.”¹ The truth of the matter is that much of the blame for the situation can be placed on the engineering profession itself for not aggressively promoting an accurate image of engineers and engineering. By instead letting engineering become the “stealth profession,” a variety of inaccurate/incomplete images have come to dominate the public’s mind, including the minds of many pre-college students currently considering which career path to choose. As a result, engineering finds itself in need of a makeover, one yielding a strong, popular image conveying – accurately and completely – all that is good and inspiring about engineering and engineers. This article seeks to put forth a framework on the road to achieving such a makeover, to the overall benefit of the profession, both in terms of enhancing engineering’s public prestige and in attracting today’s students – particularly the “best and brightest” – to become tomorrow’s engineers.

¹ Source: Press Release For “Maintaining a Strong Engineering Workforce.” Issued 6/03 by ACT, Inc. (online at www.act.org).

APPENDIX: Engineering’s Poor Public Image

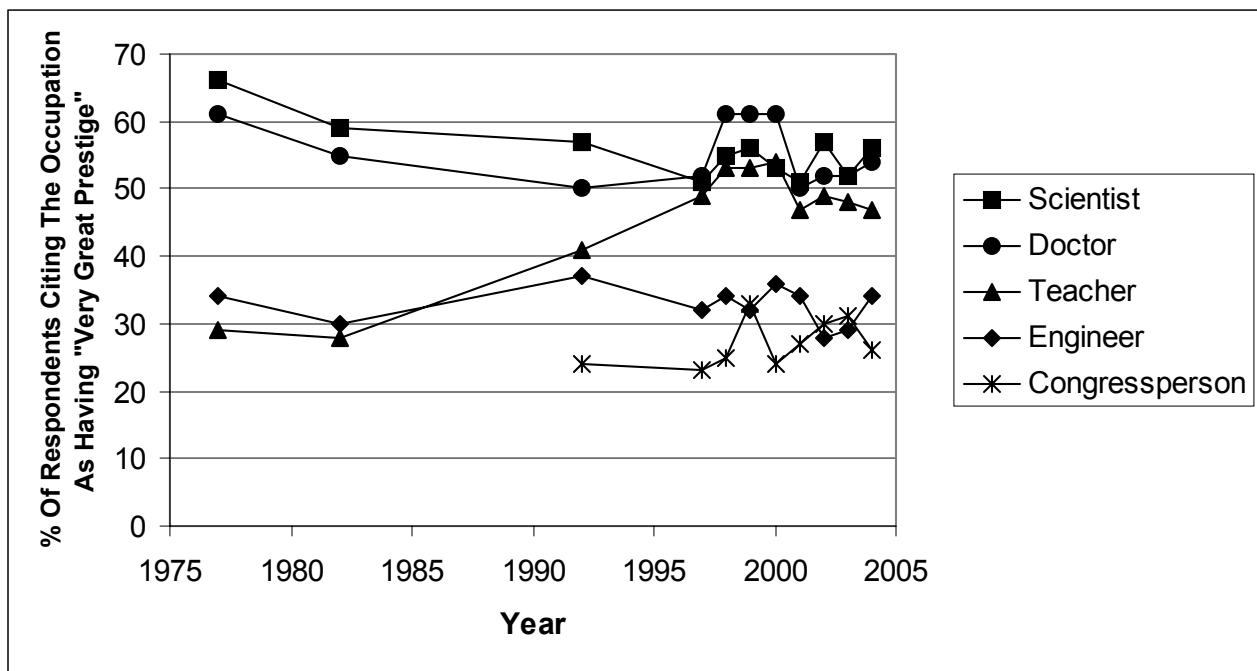
Despite highly visible and widely beneficial accomplishments, engineers perform their critically important work in relative anonymity, to the point of the profession even referring to itself as being the “stealth profession.” Such obscurity has a distinct downside, however, resulting in, from a general public standpoint:

- The two most famous engineers arguably being a nerdy comic strip character – “Dilbert” – and a spacecraft engine room operator – Scotty from the TV/movie series “Star Trek.”
- Engineers being viewed as having just a fraction of the relative prestige garnered by their closest peers – scientists – while ranking an inglorious 9th out of 22 common professions in terms of perceived prestige.¹ (See Figure 1 below for the results noted over time for select occupations.)
- Engineers being given relatively little credit for improving the general quality of life, saving lives, protecting the environment, or caring about their community or social concerns.²
- Engineers being believed to be anything from locomotive train operators to mechanics/technicians, to construction supervisors, to generic “computer people” – basically, simple builders, operators, or maintainers, but not the designers, planners, creators, and inventors that they really are.

Besides bruising engineers’ egos, engineering’s poor public image and standing has one serious consequence: driving students – particularly the “best and brightest” – away from engineering studies/careers, an undesirable situation with serious implications for the nation as a whole – given engineers’ critical contributions to society – as well as for the profession itself. In fact, the current student situation is serious enough for the academic testing group ACT, which has documented a steep decline in student interest,³ to warn that the future of engineering in the U.S. is in jeopardy, concerns echoed by U.S. government officials as well.

Additionally, this poor public image no doubt contributes to the profession’s failure to achieve gender and minority diversity on a par with other scientific fields, as detailed in two reports by DedicatedEngineers being released in conjunction with this document.⁴

Figure 1. Public Opinion Poll Results Over Time For Select Occupations (Source: Harris Poll #69, released 9/1/05)



¹ Source: Harris Poll #69, released 9/1/05. Available online at www.harrisinteractive.com/harris_poll.

² Source: “Raising Public Awareness of Engineering.” National Academy of Engineering. 2002. Available online at www.nae.edu.

³ “Maintaining a Strong Engineering Workforce.” Issued 6/03 by ACT, Inc. Available online at www.act.org.

⁴ The two reports – issued 6/23/06 and available online at www.DedicatedEngineers.org – are:

--- “Women in Engineering & Related Fields – Diversity Analysis of Students Earning Bachelor’s Degrees”

--- “Minorities in Engineering & Related Fields – Diversity Analysis of Students Earning Bachelor’s Degrees”