

# Engineers and K-12 Education: The Characteristic Differences Between Engineering and Elementary Education Majors

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## ABSTRACT

For ages many jokes have been written describing the characteristics of different professional fields, like politics, and attributing to them a nature that makes the majority of readers laugh and agree. For engineers that nature is one of academic genius trapped within the body of a social disaster while teachers, more specifically elementary teachers, tend to be the opposite. They tend to be more sociable but always outwitted by their students in the typical joke. This paper examines the actual characteristics of a select group of individuals, both engineering and elementary education majors at Iowa State University, compares the results for any notable differences and offers an explanation for any results that were found.

## TOYING WITH TECHNOLOGY

Engineering undergraduates are hired to work in the Toying With Technology<sup>SM</sup> (TWT) lab in 2220 Howe Hall as lab monitors and teaching assistants. Listed both as CprE 370 and Mat E 370 under the ISU course catalog, the TWT program was designed “to offer a technology class aimed at students, particularly education majors, who are in non-technical fields but want an appreciation for the technological innovations that surround

them.” (TWT website) Additionally, students taking the class should emerge equipped with resources to effectively incorporate technology into their future classrooms. All of the students enrolled in the TWT program courses are education majors and the only non-education majors in that room are staff personnel.

## **THE TWT STAFF**

Dr. Larry Genalo, professor in the Materials Science and Engineering department, supervises the TWT program with the assistance of graduate Teaching Assistant, Melinda Gallagher, of the college of education. The undergraduate staff members consist of two engineers and two education majors. A group of six individuals is not large enough for conclusive statistical data but when all the engineers on the TWT staff exhibit similar characteristics, which are distinctively different from those that are demonstrated by the education majors, it makes one wonder if there is a correlation between the two majors and the characteristics demonstrated by their members.

## **CHARACTERISTICS OF THE ENGINEERS**

The engineers on the TWT staff are effective at problem solving and thinking logically, but lack good communication skills. Stereotypically, engineers have poor social and English skills, and considering other engineering students enrolled at Iowa State University, that stereotype seems appropriate. According to the Institutional Research department at Iowa State University, the average math ACT score of entering engineering freshmen was 27.6, a full three points higher than their average english ACT score of 24.6.

## **CHARACTERISTICS OF THE ELEMENTARY EDUCATION MAJORS**

Contrary to the engineers, the education majors on the TWT staff dislike math and science, most particularly physics, and perform poorly in these subjects. However, their English skills are superior and they communicate effectively, especially to large audiences. The elementary education majors are also more creative, organized, patient and nurturing than the engineers. Whereas the engineers had a higher average math

score, the average english ACT score of entering elementary education majors (23.3) was higher than their average math ACT score (22.9).

This obvious discrepancy between skills and majors makes one wonder why it is that engineers are so different from elementary education majors. It is not a coincidence that engineering and elementary education majors have certain distinctive skills, but rather it is those skills that make them choose engineering or elementary education majors.

## **HIGH SCHOOL COUNSELORS AND CAREER TESTS**

Earlier it was shown that engineers were much better at math and science than at English. This is so because many people that do well in math science are prompted to go into engineering, regardless of how proficient they are in English. High school counselors, parents and others impact the decision of students when they select a college major for the vast majority of graduating high school seniors, and they tend to promote engineering for students that excel in math and science.

Career tests are another important factor that influence high school students to enroll in certain majors by matching their skills to a preset list of majors which require those strengths. One such test is the American Career Test™ which can be found online at <https://www.acareertest.com/>. Among the questions asked on the test is one that requires the user to rate how well they “communicate instructions effectively and clearly, resulting in action,” and to indicate their level of interest in “giving information, teaching, advising, [and] helping others.” The test regards an individual’s ability to teach much higher than their math skills, which would explain why career tests prompt students to become teachers who do not have exemplary math and science skills.

## **CERTAIN SKILLS ARE REQUIRED BY THE NATURE OF SOME MAJORS**

It has been shown that career counselors and tests influence students with strong math and science backgrounds to become engineers, and that math and science are not emphasized to become an elementary educator, but the question is still left unanswered: why do they prompt students with certain skills to go into those majors? A solution is

simply that some skills are necessary for success in one major, but not in another. The prime example here is math ability. Mathematics is essential for most, if not all engineering courses and careers. The level of math required for those engineering courses is also typically at the calculus stage or higher. However, although English skills are necessary, it is not as essential in the majority of engineering courses offered at Iowa State University.

On the contrary, there are not many elementary education courses which require students to have as vast a math foundation as engineers. Whereas Calculus I and II are required by the basic engineering program, no calculus is required by the elementary education program. However, the elementary education program does require students to be able to write lesson plans, and many of the classes that are offered in that college entail a reasonable level of writing competence.

## **CONCLUSION**

Yes, it is true that engineers possess different skills than elementary education majors, but those two groups of people do not automatically gain new characteristics as they choose their majors. Instead, those individuals always had the skills they possess, but because they have those skills, were influenced to go into their respective majors. Students with a strong math background who think logically and are good problem solvers were influenced to become engineers, most likely because a counselor recommended them to or they realized that the major whose requirements matched their skills was engineering.

Students who are patient, nurturing and creative would most likely want to be elementary educators, because those are all characteristics of a good elementary educator. Although math and science are not bad properties of a good elementary educator, they are not required, not even by the college, and results in the vast majority of elementary educators not taking high level math classes.

While the stereotype presented by common jokes may be unjustified, it can be ascertained that engineers really are different from elementary educators. However, with the advent of courses like *Toying With Technology<sup>SM</sup>*, those differences will be significantly reduced as education majors have a resource to strengthen their math and science skills, while gaining a better knowledge and appreciation for engineering.

Engineers will also gain a better understanding of learning processes and the importance of communication skills through the TWT or similar programs.

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