

Understanding the Learning Styles of Minority Students in Engineering

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Minorities continue to be underrepresented in construction and engineering programs. This paper looks at the typical profiles of Myers-Briggs Personality Index (MBTI) testing performed on engineering students and compares these results to minority students. Suggestions are provided for faculty on how they might use the results of MBTI to increase and retain minorities in their programs.

Key Words: Myers-Briggs, minorities

Introduction

Unfortunately, minorities have a long history of being underrepresented in engineering programs nationwide (Frair, Cordes et al. 1997). Many different factors have been identified that may influence a student's decision to enter field of engineering, regardless of race, including poor relationships of students with faculty, poor teaching, inadequate survival skills, lack of role models in schools, and low teacher expectations (Millar n.d, BLAC 1994, Glaze and Wright 1998).

Background

The education literature suggests that a key factor in student learning is for the student to be actively engaged in the learning process (Dewar 1999, Hartman 1995). Active engagement in the learning process engenders in students a strong sense of personal empowerment and self-image. For many black college students the problem of poor self-image and low self-worth may deter them from entering into construction or engineering. This is in large part due to the fact that faculty not understand and fully appreciate the learning style preferred by their minority students. Engineering programs are designed to immerse students in heavy math and science courses that have activities that emphasize rewards for certain attributes of students that not all engineering students share (Beasley, Huey et al. 1995).

A critical factor in getting students actively involved in their learning lies in students learning style preferences. Keefe (1982) defined learning styles or learning preference as the "cognitive, affective, and physiological traits that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment." In essence learning styles define the way in which knowledge is acquired and is a function of heredity and experience. Cultural experiences also play a part in learning styles (Larkin-Hein and Budny 2000, Hale-Benson 1982).

Psychological Type

Most educational psychologists credit Carl Gustav Jung's pioneering theory of psychological type as the seminal work in the field of learning styles. In his study, *Psychological Types* published in 1921, Jung postulated that despite what may be considered random behavior in fact is a result of the differences in how people perceive information and make decisions. Since that time the effect of individual learning styles has been extensively studied and many learning style models have been developed or evolved (Excellence 2002, Zywno and Waalen 2002, Ouellette 2000). For further information regarding other learning styles the reader may want to examine (Excellence 2002) which provides web links to many different learning styles. Of particular interest to engineering faculty may be Index of Learning Styles developed by Felder and Silverman specifically for students in technical disciplines. This can be accessed on the web at <http://www.engr.ncsu.edu/learningstyles/ilsweb.html>.

The Myers-Briggs Type Indicator (MBTI) is a self administered personality inventory developed by Isabel Meyers and Katharine Briggs. The MBTI was developed to test Jung's theory of personality type. Jung originally theorized that we comprehend information based on our senses or intuition and base decisions on objective logic or subjective feelings. Jung believed that each of these four functions are used, but with differing amounts of success and frequency. From his four functions he derived eight personality types. Briggs further expanded Jung's eight personality types to include a fourth dimension: Judging and Perceiving. The eight categories that make up the 16 personality types the MBTI test for are shown in Table 1.

Table 1

Sixteen Personality Types

E Extraversion

People who prefer Extraversion tend to focus on the outer world of people and things.

S Sensing

People who prefer Sensing tend to focus on the present and on concrete information gained from their senses.

T Thinking

People who prefer Thinking tend to base their decisions on logic and on objective analysis of cause and effect.

I Introversion

People who prefer Introversion tend to focus on the inner world of ideas and impressions.

N iNtuition

People who prefer Intuition tend to focus on the future, with a view toward patterns and possibilities.

F Feeling

People who prefer Feeling tend to base their decisions primarily on values and on subjective evaluation of person-centered concerns.

J Judging

People who prefer Judging tend to like a planned and organized approach to life and prefer to have things settled.

P Perceiving

People who prefer Perceiving tend to like a flexible and spontaneous approach to life and prefer to keep their options open.

Understanding learning style differences is thus an important step in designing balance instruction that is effective for all students entering engineering and retaining them.

In 1980, eight engineering schools and the Center for Applications of Psychological Type formed a consortium to study the effects of personality type in students studying engineering (McCaulley, Godleski et al. 1983). Since then, multiple studies of the personality type of engineering students have been conducted by a number of different researchers in which the racial characteristics of the respondents was broken out (Thomas, Benne et al. 2000), (Felder, Felder et al. 2002), (Rosati 1998). Stein and Gotts, using the Keirsey Temperament Sorter, which is based on the MBTI rating, reported on the learning styles of Construction Management students specifically however, they did not break out their results by race (Stein and Gotts 2001).

Profiles of Engineering Students

In studies utilizing MBTI, educational researchers have found that as a group, regardless of race, students in engineering disciplines not surprisingly are represented far higher in logical, analytical and decisive type than the population as a whole (McCaulley, Godleski et al. 1983, McCaulley, 1990). Of particular importance to this discussion is the finding that the introverted personality types are much higher in engineers than in society. These characteristics of engineering students, which faculty may unconsciously promote conflicts with the cultural learning styles by which most African American children learn. In any discussion of learning styles, the important role that culture plays in shaping learning styles must be understood as it is responsible for the cognitive development and behavior in an academic setting (Hale-Benson 1982).

Anderson (2001) citing Madge Willis's work on the learning styles of African American children (Wills 1992), identifies the following learning styles of African American children:

- **Social/Affective:** They tend to be people-oriented and emphasize the affective domain. Social interaction is crucial, and social learning is common.
- **Harmonious:** They tend to respect and encourage the interdependence and harmonic/communal aspects of people and environment. They seek knowledge for practical, utilitarian, and relevant purposes. They seek synthesis and holistic approaches to experiences.
- **Expressive Creativity:** They tend to be creative, adaptive, variable, novel, stylistic, and intuitive. They prefer simultaneous stimulation of multiple senses and oral expression.

- Non-Verbal: Non-verbal communication (intonation, body language, movement, and rhythm) are vital to helping these students learn.

It has been suggested that gifted minority students, in particular those sought out by higher education, without “positive racial identities may be particularly vulnerable to negative peer pressure” because of the student’s need for affiliation is greater than their need for achievement (Ford and Thomas 1997). Minority students studying engineering may not have strong self confidence – they therefore more likely to leave the engineering field because of a sense of isolation because of a lack of “connectedness” to their fellow students. This sense of isolation is increased when the faculty may not teach to the student’s particular learning style.

What can be done

For educators assessing the personality type make-up of students within the classes taught is important. This assists the professor in developing activities that will cross all personality types and assists students in improving their problem solving abilities. Understanding personality type also helps the professor in understanding the behavior of students in the classroom and the laboratory. Knowing personality type provides the instructor with a means to coach students on ways to improve their learning and testing. For minority students, coaching or mentoring, and learning with other students have been proven to be particularly successful in retention and student success. Other ideas to assist engineering educators to reach all the different personality types as determined by the MBTI can be found in Chang and Chang (2000) and Felder and Silverman (1988).

A Caution

Despite the evidence that cultural difference in learning styles exist the whole field of “learning styles” remains controversial (Stahl 1999, Denzine 1999). (Frisby 1993) in particular argues that the idea of a black cultural learning style is flawed and smacks racism. Perhaps even more worrisome is the use of personality tests like the MBTI to pigeonhole people into particular occupational fields or fields of study (Zemke 1992). Minority and other students that do not fit the perceived personality type of most engineering practitioners may be counseled into another field that is more similar to their personality type.

Conclusions

It is clear from our position at the head of the classroom that minorities are grossly under represented within the construction and engineering field. If the ranks of construction professionals are to be filled it than the pool of minority students in college engineering programs must be encouraged and enlarged. The best way to accomplish this task is by understanding the personality type of the minority student in the classroom and developing a program that fits their learning style. Only than can we expect to see a improvement in the graduation rates of minorities in construction and engineering programs.

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