

Enhancing Engineering Student Success: Working With Students to Change Their Attitudes

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INTRODUCTION

The need to bring about greater success on the part of engineering students is not the topic of this paper. The fact that we do is assumed to be self-evident. We only have to consider the anecdotal statements of engineering professors that “students aren’t what they used to be,” or measure our graduates against the outcomes established by the new ABET Engineering Criteria 2000,¹ or look at the low transfer rates of students who start engineering study in community colleges, or look at the differentially low retention of minority students (African-American, Hispanic, and Native American) to convince ourselves that there is lots of room for improvement. If that’s not enough, we can always take the TQM view that “no matter how good we are doing, we should always strive to be better.”

An Introduction to Engineering course with a primary focus on “student development” can provide an ideal vehicle for working with first year engineering students to enhance their chances of success. A Student Success Model (Figure 1), taken from Chapter 4 of Landis’ text *Studying Engineering: A Road Map to a Rewarding Career*,² suggests three steps in this process:

1. Strengthen students commitment to the goal of success in engineering study
2. Change student behaviors to those that will bring about that success
3. Change student attitudes to those that will lead to those behaviors

These steps to success are much better said in the Brihadaranyaka Upanishad IV.4.5:³

You are what your deep, driving desire is.

As your desire is, so is your will.

As your will is, so is your deed.

As your deed is, so is your destiny.

Previous papers by the first author have addressed Steps 1 and 2. In his 1996 paper,⁴ Landis provides a practical guide to strengthening students’ commitment to engineering study. In his 1997 paper⁵ (Republished in edited form in the November, 1997 issue of *PRISM* magazine⁶), Landis presents a five-step approach that has proven highly effective in changing engineering student behaviors.

The purpose of this paper is to describe approaches which have proven effective in accomplishing the third step in the process, i.e., working with first year engineering students to adjust their attitudes to those that will contribute to their success as engineering students.

THE IMPORTANCE OF ATTITUDE

The importance of attitude in achieving success has been expressed from the earliest times as indicated by the following quotes from the classics:

“They can because they think they can.” - Virgil

“Our doubts are traitors, and make us lose the good we oft might win, by fearing to attempt.” - William Shakespeare

“The mind is its own place, and in itself can make a heav’n of hell, a hell of heav’n” - John Milton

More recently Charles R. Swindol described the importance of attitude:⁷

“The longer I live, the more I realize the impact of attitude on life. Attitude to me, is more important than facts. It is more important than the past, than education, than money, than circumstances, than failures, than successes, than what other people think or say or do. It is more important than appearance, giftedness, or skill. It will make or break a company, a church, a home.

The remarkable thing is we have a choice every day regarding the attitude we will embrace for that day. We cannot change our past. We cannot change the fact that people will act in a certain way. We cannot change the inevitable. The only thing we can do is play the one string we have, our attitude.”

Given these perspectives on attitude, it is not surprising that a recent excellent work by Besterfield-Sacre and others at the University of Pittsburgh⁸ indicated that the attitudes engineering freshmen bring with them have a significant impact on their success in engineering study. Through this work, the *Pittsburgh Freshman Engineering Survey* was developed and used to measure the attitudes of engineering freshmen in thirteen categories. The study showed that attitudes of engineering students correlated well with student persistence in engineering, therefore providing a tool to identify “high risk” students.

While we would all tend to accept the familiar cliché

Positive attitudes produce positive results;

Negative attitudes produce negative results

we would probably differ in our view as to whether it is our role as engineering educators to work with our students to change their attitudes and whether we are or can be effective in this role. Your view on this issue is probably not “black or white.” It is likely that you are willing and are, in fact, already working to impact student attitudes in some areas, but may be reluctant to take on attitudes in other areas. First, let’s identify some of those attitudes that impede students’ success.

NEGATIVE ATTITUDES THAT IMPEDE ENGINEERING STUDENT SUCCESS

As suggested by the Student Success Model in Figure 1, the establishment of a goal provides a criteria which can be used to judge attitudes as either negative or positive. Negative attitudes are defined as those that lead to non-productive behaviors, i.e., behaviors that tend to interfere with students’ academic success. Positive attitudes are defined as those that lead to productive behaviors, i.e., behaviors that support students’ academic success.

Among those negative attitudes that can inhibit the academic performance of first year engineering students are:

- Weak commitment to goal of graduating in engineering
- Unrealistic view of what's expected (e.g., overconfidence, naiveté)
- Low self-confidence
- Lack of self-worth (i.e., tendency to sabotage their success)
- External "locus-of-control" (i.e., adoption of victim role)
- Unwillingness to seek help
- Resistance to change (e.g., personal growth and development)
- Tendency toward procrastination (e.g., negative view toward time management)
- Avoidance of areas of weakness or perceived unpleasantness (e.g., written communication, interpersonal interaction, chemistry)
- Reluctance to work with other students (i.e., avoidance of group study)
- Negative view toward authority figures (e.g., parents, professors)

How is it that bright, academically prepared first-year engineering students could hold a series of negative attitudes that threaten their academic success, and not do anything about the situation? One would think that such students as logical thinkers and analytical problem solvers would identify the "problem" and solve it. The reasons so many students don't provides the direction we, as engineering educators, need to be more effective at helping them.

Students' values and attitudes, instilled in them throughout their childhood, are deep and often not rational. Furthermore, students may not be consciously aware that they hold certain attitudes. Even when they are aware of a negative attitude, they may not believe they can change it. How often have you heard someone say: "Well, that's just the way I am."? Or they may not want to change, not realizing the consequence of holding the negative attitude. (e.g., "I like being disorganized.")

An excellent reference on the impact of one's attitudes on their success is Deekpak Chopra's book *The Seven Spiritual Laws of Success*.⁹ Students would benefit from reading this book, particularly if assisted in processing and internalizing the concepts.

Chopra's "Law of Giving" explains the consequences of our thoughts and actions:

If you want joy, give joy to others; if you want love, learn to give love; if you want attention and appreciation, learn to give attention and appreciation; if you want material affluence, help others to become materially affluent.

Chopra's "Law of Karma" explains the importance of becoming "conscious,"

Most of us, as a result of conditioning, have repetitious and predictable responses to the stimuli in our environment. Our reactions seem to be automatically triggered by people and circumstances, and we forget that these are still choices that we are making in every moment of our existence. We are simply making these choices unconsciously.

and how through doing so, we are able to change our choices:

If you step back for a moment and witness the choices you are making as you make those choices, then in just this act of witnessing, you take the whole process from the unconscious realm into the conscious realm. This procedure of conscious choice-making is very empowering.

APPROACH TO CHANGING STUDENT ATTITUDES

Figure 2 provides a methodology for helping students change negative attitudes to positive ones. The steps in this methodology are as follows:

1. Identify key areas in which engineering students' attitudes will have a significant impact on their academic success
2. Assist students in becoming "conscious" of the attitudes (both negative and positive) they hold in these areas.
3. For each attitude have students answer the question: "Is this attitude working for me (positive attitude) or against me (negative attitude)?"
4. For each negative attitude, have students answer the question: "Why do I hold this attitude?" (i.e., What is its source?)
5. Have students answer the question: "Can I change an attitude that is not working for me (negative attitude) to one that will work for me (positive attitude)?"

Since the time available in an Introduction to Engineering course is not adequate to work with every student on each of his or her negative attitudes, the objective should be to provide students with "self-modification" skills such that they have the ability to negotiate the five steps above on their own. The efficacy of such self modification skills is documented in the psychology literature for those interested in more depth on this subject.^{10,11,12}

The following describes a practical approach for implementing the above five steps in an Introduction to Engineering course.

Step 1. Conduct an exercise during class in which you ask students to identify key areas about which their attitudes (positive or negative) are likely to have an impact on their academic success. During this brainstorming session, write all responses on the blackboard. Feel free to add a few of your own.

Step 2. Pick 8-10 of the areas listed, and as a homework assignment have each student write down three positive attitudes and three negative attitudes they have about each area.

Step 3. During the class period in which the homework assignment is due, have volunteers share negative attitudes they have about each of the areas. Ask each respondent to answer the question: "Is this attitude working for me or against me?" Note that you may find in some cases

what students perceive as a negative attitude may in fact be working for them (e.g., a negative attitude toward the inertia of the university bureaucracy may have taught the student to be more effective in how he or she approaches dealing with it).

Step 4. For each attitude that is not working for a student, ask him or her: “Do you know why you hold this attitude? Where did it come from?” In some cases, the attitude may have a legitimate source. For example, a student that is taking 16 units and working 40 hours a week may have a very legitimate reason for resenting the amount of homework he or she is required to do. In such a case, the possibility of eliminating the source of the negative attitude can and should be explored.

The primary purpose of asking students to identify the source of negative attitudes is to emphasize that in most cases negative attitudes were learned and hence can be unlearned. Another way to illustrate to students that attitudes are not absolute is to have several students in the class describe their attitude about a specific issue (e.g., “What is your attitude about this class and what we are doing here today?”). Seeing that their peers have much more positive attitudes can have a strong impact on a student’s negative thinking.

Step 5. For each attitude that is not working for a student, ask him or her: “Can you change the attitude to one that will work for you?” Teach the students that one of the best techniques for changing a negative attitude to a positive one is to find a higher context for their thinking. For engineering students, the most appropriate higher context is their goal of success in graduating in engineering.

For example, let’s imagine that a student relates that she is failing math because the professor is boring, unprepared, never smiles, and doesn’t like her. This student has developed the belief that: “I can’t pass a course if I don’t like the professor.” The student has adopted an external locus-of-control in which passing her math course is viewed as totally in the control of the professor. It is important that she become “conscious” that this is a negative attitude (one that interferes with her goal of success in school), and further that she come to realize that the attitude can be changed. Suggestions from the class might lead her to change her attitude to: “I can pass a class when I don’t like the professor, but it is going to require me to adopt alternate strategies and to put in more work.” This positive attitude might lead to behaviors that include sitting in on another instructor’s lectures, getting old exams, or seeking help from students who passed the course last semester. (Note: This example was provided by Madeline Fish¹³)

CONCLUSION

An Introduction to Engineering course can be an effective vehicle for working with first-year engineering students to enhance their success. Three steps are key to this process: 1) strengthening students’ commitment to success in engineering study; 2) changing students’ behaviors to those that will bring about that success; and 3) changing student attitudes to those that will lead to those behaviors. Previous papers by the first author (Refs. 4, 5, and 6) have addressed the first two steps in this process.

This paper presented an approach for accomplishing Step 3. A case was made for the fact that many first year engineering students bring negative attitudes with them that impede their success in engineering study. Generally, within engineering education no direct or explicit efforts are made to address this situation. A step-by-step approach was put forth which has proven effective

in working with first year engineering students to identify and change negative attitudes. It is anticipated that widespread implementation of this approach within Introduction to Engineering courses would improve the success of first year engineering students.

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Figure 1 - Student Success Model

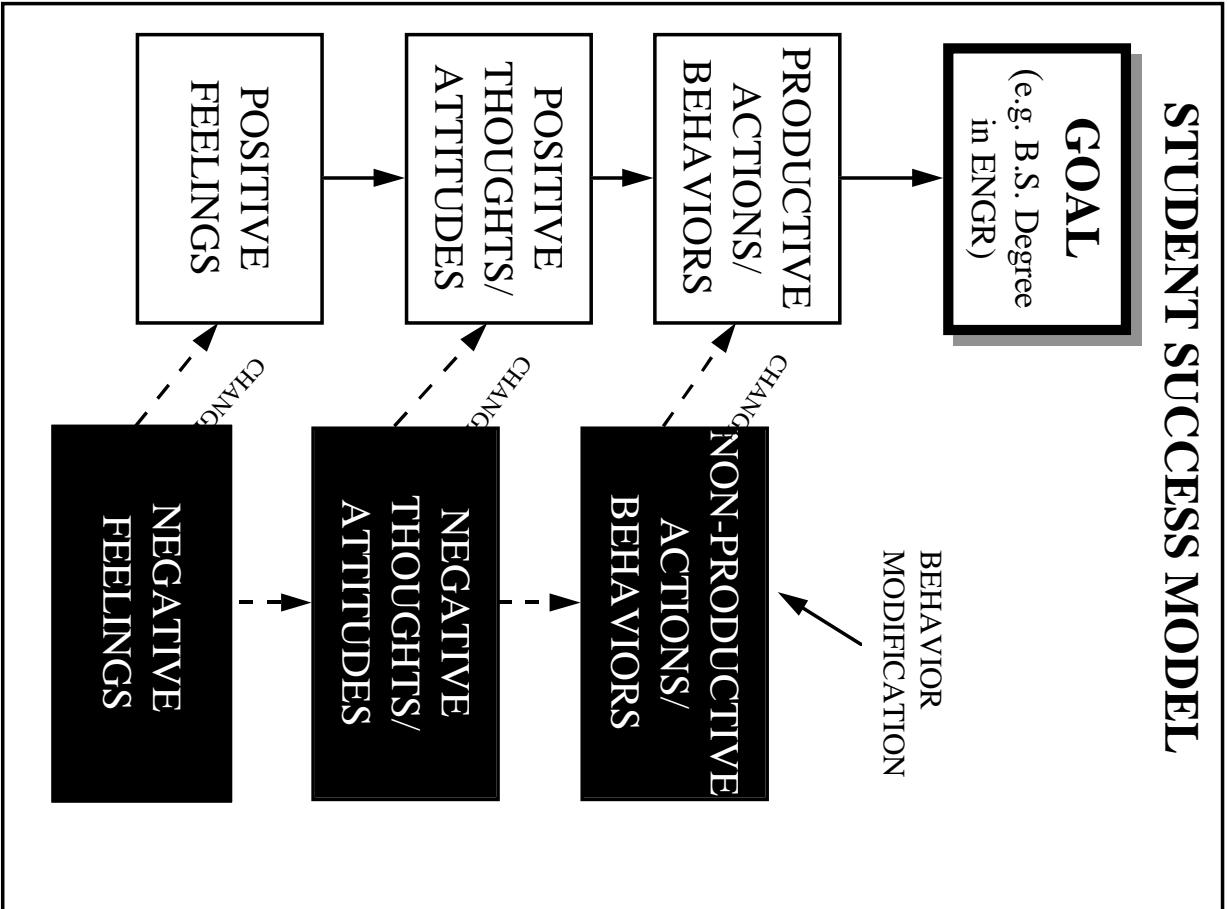


Figure 2

Methodology for Changing Negative Attitudes to Positive Ones

