

Five + Five = Success: Characteristics and Secrets to Success in Engineering

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Abstract - With so much emphasis on university and college rankings, graduation and completion rates and the first and second year retention rates in engineering, figuring out a way to increase retention rates in the first and second year is not only important to faculty, administrators, advisors, alumni, parents and supporters, it is critical for providing an engineering workforce in this country. This presentation discusses five characteristics for successful students as well as five secrets of success to help first year students develop a skill set needed to establish a strong foundation for success that will propel them into their second year. Attendees will be encouraged to explore and to consider different strategies for communicating this information to students.

While many of our students arrive well-prepared academically, most are not as adept in the area of the soft skills required to be successful. The rigors of engineering disciplines and making a successful transition from high school mean that our students can face serious challenges in their first year. The anxiety, frustration and stress felt by the students who are not prepared in these soft skill areas can be overwhelming and can contribute to a student leaving engineering for a less demanding major.

Successful students share common characteristics regardless of their academic preparation, socioeconomic status, gender, ethnicity, major, birth order or any other demographic factor. These characteristics are present in an individual because of a deeper level of self-awareness, maturity or life experience.

Most newly minted engineering students arrive on campus having performed very well in high school, particularly in their math and science courses. Without understanding that the expectations and the environment have drastically changed, these students rely on the skills and behaviors they learned in high school and try to apply the same skills to their college coursework. New college students tend to work by themselves, attempting to memorize information and formulas without being able to apply the material to new problems and situations. New students rarely understand the amount of study time now required to be successful and might have difficulty balancing their new found freedom with the demands of their coursework. If the student is also struggling with learning and adapting

to their new environment, then the student may begin to feel that engineering is not for them.

It is usually after the first round of exams when new college students begin to understand that expectations have shifted and that their new environment is quite different from high school. Some students are ready to hear new ideas and strategies about how to approach their studying, where others simply are not ready to give up their old habits and comfortable behaviors. It is for this reason that success strategies should be communicated at various times in the first and second semesters, as well as in a variety of formats, so that student will receive the message when they are ready to hear it.

Index Terms – developmental advisement, holistic advising, comprehensive advising

FIVE CHARACTERISTICS OF SUCCESSFUL STUDENTS¹

Developed over the course of many years and after working with thousands of students, the professionals at the Sanger Learning Center on the University of Texas at Austin campus have identified five general characteristics of successful students: 1) ability to use help seeking behaviors 2) recognition of the importance of self-discipline 3) acknowledgement that engineering/college is a highly competitive environment, 4) positive attitude and 5) skills/ability to adapt to different learning environments. Sharing these characteristics with prospective and current students and their parents at every opportunity allows discussions about behavior and expectations to begin at home and can continue during the first year.

Help Seeking Behaviors

Students who possess the ability and maturity to seek help, in whatever way that manifests for the student, are more likely to be successful. Help seeking could be related to academic help such as tutoring, advising, course planning and selection, attending office hours and group study among many other possibilities. It is logical then, that students who seek out help in this arena are more likely to not only get the help they are seeking but collect additional information and resources that lead to new opportunities and future success. On the flip side, students who are resistant to seeking help either due to over confidence or fear are then less likely to

receive additional resources, tips, tricks and opportunities that can contribute to success.

Self-Discipline

We all know that self-discipline is required to achieve almost anything. Many of our students arrive on campus having achieved a lot in high school, but the transition to a self-disciplined lifestyle on their own can be enormous. New found freedom and the lack of parental oversight can set up a tempting situation for students with little self-discipline that leads to disastrous academic outcomes. Students who quickly learn to regulate their behavior and who can make responsible decisions about their academic life while in college, are more likely to have successful academic outcomes.

Highly Competitive Environment

Though not necessarily exclusive to engineering colleges, a highly competitive environment can be a new challenge for our incoming students. Many college students in senior, research driven universities arrive on campus having been at the top of their high school class, without realizing that nearly everyone else on campus is also from the top of their class. This creates a very different learning environment in which students begin to realize that they are no longer the smartest nor most talented student in their class, major or department. Additionally, professors generally do not have much information about the academic backgrounds of their students and thus have no preconceived notions about their abilities. In some environments, students experience additional competitive influences when they compete for internships, research positions, scholarships and academic honors. Understanding, acknowledging and adapting to this new competitive environment is critical to student success.

Positive Attitude

Maintaining a positive attitude and outlook on life can be the difference for some students in whether they continue in engineering or not. Engineering is a challenging curriculum, in a competitive environment that requires a tremendous amount of dedication, self-discipline and hard work. While everyone has their occasional doubts, fears and bad moments, an overall positive attitude is what can carry an individual through those tough times. This concept of having and maintaining a positive attitude could further be expanded to include the ideas of locus of control² and mindset³, whereas students who believe in an internal locus of control and/or who have a growth mindset are more likely to overcome hardships and difficult circumstances.

Adapting to Different Learning Environments

There are many different environments that our students must be able to learn in during their time in college, reflecting both physical, organizational and style differences. Large lectures, small recitations, seminars, labs, tutoring, office hours, and a variety of others represent the

different settings and size of class a student might encounter. Additional obstacles that student may face in a classroom could be various teaching styles, cultural differences and language barriers. Students who are successful in college possess the ability to adapt to all these different learning environments without difficulty or added stress. While it is not realistic to expect that students possess the ability to thrive in all of these learning environments, students who are able to adapt are successful because they possess a degree of flexibility and can perhaps mold their learning style to different environments.

FIVE SECRETS FOR SUCCESS IN ENGINEERING

The five secrets for engineering success are: 1) Using A Planner 2) Engineering Study Formula 3) Understanding & Managing Time 4) Study Groups & Tutoring and 5) Separating Study & Living Spaces.

Using A Planner

Using a planner seems like a simple, silly suggestion to students but, there are many students who have not learned this skill and are not in the habit of mapping out their day, week, month or semester. Students who take the time to organize their day are generally better able to manage their time throughout the day and to use breaks efficiently. As Grace Fleming⁴ writes, “poor organizational skills can reduce your final scores by a whole letter grade.” Students who map out their day, week, month and semester are able to see when they can fit in proper study time, leisure activities as well as additional preparation time required for exams.

When the day is scheduled, students are more likely to stay on schedule and get work accomplished. While most of our students are skilled at mapping out their semester class schedule during registration or are able to follow the degree plan, they fail to fill in the gaps between classes, nor do they recognize the overall picture of the semester. When you ask a student to estimate the number of weeks in the semester or the number of class meetings for each class, most students have no understanding or have never considered what these are. Semester long classes generally meet for either fourteen or fifteen weeks and have between thirty and forty five class meetings. Once a student has an understanding of the actual time allotted for the class, there can be a more in depth discussion of the ramifications for missing class as well as the need to stay organized throughout the semester.

Engineering Study Formula

As discussed earlier, most engineering students excelled in their math and science courses in high school and clearly have a set of skills and behaviors that contributed to their success. But as the expectations increase in the college level courses, so must the study skills and time spent synthesizing material. The engineering study formula that we suggest for students at The University of Texas at Austin is that students are spending two to three

hours studying for every hour spent in class. For some classes the number of hours studying might have to increase depending on the work level and difficulty. For other classes, the number of hours required might be closer to a 1:1 ratio. The important thing for students to remember is that there is a suggested formula and it should be used as a starting point to map out their study time for the semester. It is also necessary to address the definition of studying during this discussion. Many students have a singular view of what studying is and have not considered other methods or options to get work accomplished. Studying can take the form of reading a textbook, doing assigned homework problems, doing the unassigned homework problems, attending a Supplemental Instruction class, getting assistance from the Teaching Assistant or Tutor, group study, developing questions from notes or homework, taking practice tests, reviewing notes, rewriting notes and many other varieties of work. All of these forms should be viewed as study time and a simple discussion can open the eyes of your students to see that they can achieve the engineering study formula quite easily. It is also useful to point out for a student that if they are enrolled in fifteen credit hours, the suggested study time would be about forty five hours a week. Coupled with the class time, this suggests a sixty hour work week. As a professional engineer, this is not unlike what they should expect to be working in the near future. Liking their time studying to that of their future work life seems to make sense to students and begins to show them what life will be like once their time as a student ends.

Understanding & Managing Time

Successful students are the ones that recognize early on that they simply cannot do it all on their own. This is one of the biggest hurdles that many engineering students face. Students who performed well in high school, where the model was to work independently, have mastered this skill. But again, the rules have changed now that they are in college. In order to be successful in engineering, students have to work together. Over the years the author has observed many students who have tried to go it alone, and some do have some success early on in their coursework but always seem to hit a point in which they begin to struggle. Students who make the decision to seek assistance early on find that it is much easier to access the resources and to start making new friends and contacts. Students who wait to seek resources when they have hit a wall find that it is much harder to find and to integrate into a study group.

During new student orientation, students are encouraged to build their network of friends so that they can form study groups more easily once the semester begins. Some of the best advice for our students is to make the decision to seek tutoring from the start of the semester and to stick with it throughout the semester, even if they really do not believe that they need it. One strategy would be to encourage students to make the decision to attend tutoring on a daily basis and work on different classes in the tutoring

center. It can be a social environment which makes it easy to meet others and to form study groups. As students are working on homework or problem sets, they find that there are parts of the problem or homework that one person understands and other parts that others understand. Through discussion with others, students discover that they are learning from each other. As an added bonus, there is a tutor there if everyone is stuck or if the group just needs another explanation. The more engineering students they interact with and get to know in these settings, the easier it will be for them to form those all-important study groups, learn about classes, professors, test banks, student organizations, internships, jobs, research and a wide variety of other information that is passed down from one student generation to another.

Separating Study & Living Spaces

Separating the study and living spaces is the final key to success. For students living on campus, this sometimes presents a new challenge since they are essentially living and working in the same area. However, it is important to educate our students about the need to separate where they work or study from where they live. When students make the decision to study outside of their immediate living quarters, then they are more likely to interact and to work with others, which is vital to their success. Once again, students have to overcome the tendencies and skills that they perfected in high school of studying alone, at home, and in their bedroom. For students to be truly successful in college, working with others is key and developing skills that will carry them into their adult working life is essential. For the sixty or so hours that students need to be at work studying, we should be encouraging them to make the decision to do that outside of where they live. The place that they live should be a sanctuary to relax, unplug, rest and rejuvenate. Rest and relaxation are vital to the success of our students and we need to make sure that they are doing both effectively.

So how can we communicate these strategies to our students in ways that benefit them? When is the best time to share and discuss these strategies? Do you include parents in the discussion? What should be the timing for sharing and discussing this information? Because students arrive at our universities at varying levels of preparedness and at different stages in their development there is likely a need to present these strategies in a variety of formats and at regular intervals during the first year. Some students are ready to hear and to implement the strategies before they have had college experiences; others might need to struggle before they are ready to see what changes they must make to be successful.

Adopting a wide range of approaches will ensure that all students hear the message in the format and timing that suits their needs. First year seminar courses, orientation, student panels, printed materials, social media are just some of the ways in which the message of success can be shared.

In conclusion, these five simple ways of structuring time and approaching engineering study can make a big difference in the lives of our students if we communicate them effectively and routinely. Coupled with the characteristics of successful students, as well as reinforcing these characteristics with our students, we will be able to set our students on a path toward success with the ultimate goal of increasing our retention and graduation of more engineering students.

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