

2006-1849: INCREASING RETENTION BY INCORPORATING TIME MANAGEMENT AND STUDY SKILLS INTO A FRESHMAN ENGINEERING COURSE

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INCREASING RETENTION BY INCORPORATING TIME MANAGEMENT AND STUDY SKILLS INTO A FRESHMAN ENGINEERING COURSE

Abstract

One of the challenges to incorporating time management and study skills into a freshmen engineering course is the need for the presentation to take minimal time, but nevertheless, be effective in reshaping the habits of the freshmen students. Baylor University has adopted an inexpensive program (\$10/student) called *Success4Students* (S4S) that has been designed for college freshmen and sophomore students. It combines a three-hour-long seminar with 12 weeks of Internet based follow-up to help students develop the principles taught in the seminar into habits. Details about this program and how it has been incorporated into Baylor's freshmen engineering course will be presented along with the efficacy of the program as measured by increased GPA and increased retention. The use of the Internet self assessment as an early indicator of students who are at risk will be discussed. Finally, preliminary data on the relative importance of various principles taught in the course to students' academic success will also be presented.

Introduction

Many studies have determined that the most common reason that outstanding high school students see their GPA drop by ~1.0 during their freshmen year in college¹ is their lack of time management and study skills.²⁻⁴ As Table 1 illustrates, learning in high school is primarily in class while a significant part of learning in college is outside of class, requiring up to 500% more outside study time than was required in high school. Furthermore, the much faster pace of presentation of material in college and the larger intervals between exams make the usual high school strategy of procrastinating and then cramming untenable.

Table 1. High School vs. College

	H.S.	College
Time spent in class/wk	30	15
Study outside class	5	25-30
Learning	Directed	Self-directed
Environment	Dependent	Independent
Assessment Periods	Short	Long

Poor time management and study skills are particularly damaging to retention in engineering, where the academic demands are higher than for most majors, tempting students to change majors rather than change their approach to managing their time and mastering their course work.

The results of three studies at Baylor University involving freshmen Engineering students, freshmen Computer Science (ECS) students, and Air Force ROTC students will be presented. A study conducted at Texas A&M University involving ROTC students will also be included. All four studies involved the use a time management and study skills seminar program called *Success4Students*.

Success4Students


One of the challenges of incorporating time management and study skills into freshmen engineering classes or freshmen ROTC classes is the need for it to take minimal time, but nevertheless, be effective in reshaping the habits of freshmen students. The program that was adopted for this study is entitled *Success4Students* and has been designed especially for entering college freshmen. The program consists of a facilitated video seminar that can be presented in three hours, with a professor or professional staff member serving as a facilitator for the seminar.

The video captures an interesting discussion in a coffee shop setting between a professor and five students, each with different academic challenges. Much of the important information communicated in the video is through the students who illustrate the principles being shared by the professor with their own experiences, some good and some bad. Students are often more willing to learn from other students than from professors, and especially to learn from the mistakes of their peers, making the video presentation quite effective. The video program is presented in five segments, each about 20 minutes in length, with a 10-15 minute personal application activity that the students do in their workbooks. The 50-page workbook which each student gets includes 25 pages of notes from the seminar and 25 pages of personal applications activities. The topics covered in the seminar include:

- Select your destination (where do you want to be in five years);
- Determine your path (focusing on goal setting for the semester);
- Planning to succeed (emphasizing the importance of planning your schedule for the week each Sunday and then following it like a compass through the week);
- Maximizing your in-class learning by
 - Staying caught up in your understanding
 - Reviewing your notes between classes to be sure you are current
 - Reading the material to be covered in class before it is covered
 - Learning material each week as if the exam were on Friday of that week
 - Overcoming academic procrastination
 - Working especially hard the first three weeks of the semester
 - Listening more carefully in class but taking notes more selectively
 - Getting 8 hours of sleep/night and exercising regularly
 - Treating school like an 8-5 job, working at least 40 hours/week
- Speed Reading and Learning to triple your reading speed with better comprehension by
 - Previewing
 - Pacing
- Creative note taking and memory skills

Possibly the most innovative feature of the *Success4Students* seminar is the 12 weeks of Internet follow-up that includes a weekly self-assessment, as seen in Figure 1. Students receive an e-mail automatically each Friday reminding them to follow the link to the *Success4Students* website, where they use the self-assessment to evaluate their application of the key principles taught in the seminar during the past week. After completing the assessment, which takes 2-3 minutes, students get a numerical score on a scale of 0-100 for the past week, their scores from previous weeks, and an indication of the average score for all students who have done the assessment for

the week. This allows them to measure their academic effort (above or below average) and to see their improvement (hopefully) as they develop the concepts taught in the seminar into habits.



Close

Evaluation #1

REMEMBER: Each question is scored 1-5. The **red items** are the most important and worth double points. The **blue item** (in the first 3 weeks) is worth quadruple. Your total score will range from 0-100.

PLAN

I planned to succeed this past week by

Preparing my weekly schedule on: Tu-PM Tu-AM Mo-PM Mo-AM Sun-PM

Doing daily updates of my weekly schedule this many days 1 2 3 4 5

Following my weekly schedule (% of time) 20% 40% 60% 80% 100%

LEARN

I maximized my in-class learning this past week by

Attending my classes - missing only this many classes 4 3 2 1 0

Sitting at the front of the classroom in this many of my courses 1 2 3 4 all

Listening intently and taking notes selectively in this many of my courses 1 2 3 4 all

Reviewing notes from the previous class before the next class in this many of my courses 1 2 3 4 all

Reading book before material was covered in class in this many of my courses 1 2 3 4 all

Staying completely current in my understanding in this many of my courses 1 2 3 4 all

Treating school like an 8-5 job by arriving on average at 12PM 11AM 10AM 9AM 8AM

Sleeping on average this many hours each weeknight < 5 < 6 < 7 < 7.5 < 8

Working for this many hours attending class and studying <20 <25 <30 <35 <40

STUDY SKILLS

I improved my study skills this past week by

Using previewing and pacing for my academic reading (% of time) 20% 40% 60% 80% 100%

Taking notes in radiant format or converting to radiant format during my after class review in this many of my courses 1 2 3 4 all

Using memory techniques in this many of my courses 1 2 3 4 all

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Figure 1: Weekly Student Self-Assessment

The seminar can be presented as a 3 hour program the first week of the semester, usually in the evening, and counted as either the laboratory for the first week of class or the homework assignment for the first week. It is important that students be required to come and be given some academic credit for attending, as few incoming freshmen have a felt need to improve their time management and study skills, even though most are seriously deficient in these areas.

Alternatively, the program can be presented in 4 class periods of 50 minutes each or three class periods of 75 minutes each.

Research Questions and Methodology

The research questions to be explored are as follows:

- Can a three-hour time management and study strategies seminar impact students' academic performance?
- How important is the twelve weeks of Internet follow-up that follows the three-hour seminar?
- Can the Internet follow-up be used to identify students who need academic intervention to help them get back on track?
- What is the relative importance of the various concepts taught in the seminar on students' academic performance?

In each of the four studies to be presented, a group of freshmen students who took the seminar will be compared to a control group, as described in the presentation of each case. In some cases, self-selection is a possible factor in the results and will be noted. The primary variables that will be used to measure the impact of the seminar on students are their GPA for their first semester and persistence (or retention) in engineering.

1. Baylor Freshmen Engineering Students: Fall 2002 versus Fall 2003

Each fall at Baylor University, approximately 90 students take the introductory freshmen engineering class, EGR 1301: Introduction to Engineering. (Note this was 150 in Fall 2005). In the Fall 2003, all EGR 1301 students were required to attend the *Success4Students* seminar in lieu of laboratory the first week of class. They were further encouraged to complete the 12 weeks of Internet follow-up to get three points of extra credit on their semester average. The control group was the group of ~90 freshmen who entered during the fall 2002 and who were not given any instruction in time management and study skills. Note there was no self-selection factor in this study. The SAT scores and class rank of the two groups are nominally identical. The 2003 freshmen in engineering made a 3.04 GPA compared to the 2002 freshmen in engineering who made a 2.59. The retention of students in engineering was defined to be the matriculation from EGR 1301 to EGR 1302, which is the sequel course that freshmen take in the spring. The matriculation rate increased from 67% to 86% from 2002 to 2003, which provides further evidence that early instruction in time management and study skills can equip freshmen engineering students to succeed, increasing their GPA and the likelihood of their continuing in engineering.

2. Baylor Freshmen Engineering, Computer Science and ROTC Students: Fall 2004

One objective of this study is to separate the impact of the seminar from the impact of the 12 weeks of Internet follow-up. Approximately 200 students were included in the study. They were divided into three groups: those who took the seminar but did not complete the Internet follow-ups (59), those who took the seminar and did all of the Internet follow-ups (61), and those who did not take the seminar (78). Again, the seminar was offered the first week of school. It was

required for freshmen in Engineering but was optional for freshmen in Computer Science, giving some self-selection effect for about half the students in the study.

Freshmen in Engineering and in Computer Science who did not take the seminar made a 2.57 GPA. ECS students who both took the seminar and completed the 12-weeks of Internet follow-up made a 3.05 GPA. Students who took the seminar but did not complete the 12-weeks of Internet follow-up made a 2.7, clearly indicating the need for long-term, weekly follow-up to develop the principles from the seminar into habits. Hearing principles of how to be a successful student is much easier than developing these principles into new habits, which is the point of the 12-week Internet follow-up.

Forty-one freshmen Air Force ROTC students were invited to take the seminar, with 22 actually volunteering, since it was not required. This gives a self-selection effect. Those who took the program and did the 12-weeks of Internet follow-up made a 2.88 while those who did not made a 2.28.

3. Baylor Freshmen Engineering Students – Spring 2005

Only 26 freshmen engineering students taking EGR 1301 were included in this study. All were required to take the seminar and all were encouraged to do the weekly follow-up, or self-assessment with the offer of three points of extra credit on their semester grade. The purpose of this study was to determine whether students who were likely to make Ds or Fs can be easily recognized early in the semester by their performance on the weekly assessment. The weekly assessment scores for all students in a class are easily monitored by the professor at a portal at the *Success4Students* website where all students' scores for all weeks are recorded in a table, making it easy to identify early in the semester students who are not applying themselves effectively. Early intervention to help the student get back on track can then be made.

Students who have not invested themselves in their academics for the week are much more likely to skip doing the weekly assessment, thinking I already know I have done poorly and don't want to "look into the mirror" that the self-assessment provides. Thus, failure to do the self-assessment or a very low score on the self-assessment is usually an indication of a low level of academic effort by the student.

In this study, students who did not do the self-assessment at all or did the self-assessment and got very low scores for the first two to three weeks were considered at risk. There were 6 students out of 26 who met this criterion of being at risk. Five of them made either a D or an F in EGR 1301. Furthermore, these five students had an average GPA for all of their classes of 1.05 that semester. They were indeed at risk. Unfortunately, this criterion was developed at the end of the semester, so that no intervention was made for these students.

The sixth student was a very bright student (>1500 on SAT) who also did not do the assessment, probably because he thought it was unnecessary for someone who was as smart as he was. He apparently thought that his time management and study skills were satisfactory. He made an A in EGR 1301 and a 3.2 for his overall GPA for the semester, but lost a full tuition scholarship worth \$18,000 because he did not make a 3.5, so he too was at risk, just at a different level.

These results demonstrate that the self-assessment is useful to identify at-risk freshmen sufficiently early that interventions can be made to help get them on track before it is too late.

Using the self-assessment to identify students who were not applying themselves early in the Fall semester of 2005, I was able to reduce the number of students in a class of 47 making below a 1.0 to 2 and the number making between a 1.0 and a 2.0 to 3. The overall class average was a 2.9 and the retention from the first engineering class to the second engineering class was 85%. More importantly, only 2 of the 7 students who elected not to stay in engineering had GPAs of better than a 3.0. The average GPA of the students who left was 2.2.

4. ROTC Students at Texas A&M University – Fall 2003

The purpose of this study was to determine the impact of doing the twelve weeks of Internet self-assessment on the students' GPA. A second objective of this study is to determine the relative importance of the different principles taught in the course, as identified on the week self-assessment, on students' academic performance.

For the ROTC program at Texas A&M University, all 500 entering freshmen students came to an afternoon presentation of the seminar just prior to the start of the semester. The Air Force ROTC instructors gave 10% of their overall grade for the one-credit military science course for completing all 12 weeks of the Internet based self-assessment. The Navy and Army ROTC instructors gave less credit and less encouragement to the students to complete the 12 weeks of Internet based self-assessment, with the result being that the students were much less diligent in doing the self assessments. This allowed the effect of the Internet based self-assessment on student GPA to be evaluated. The results are seen in Figures 2 and 3.

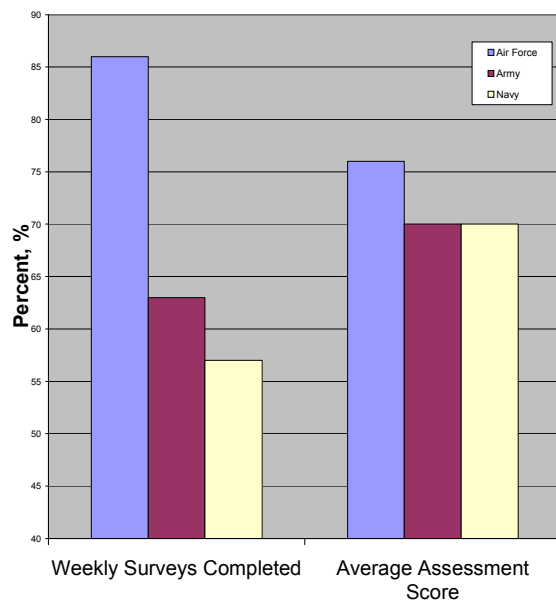


Figure 2. Self Assessment Results

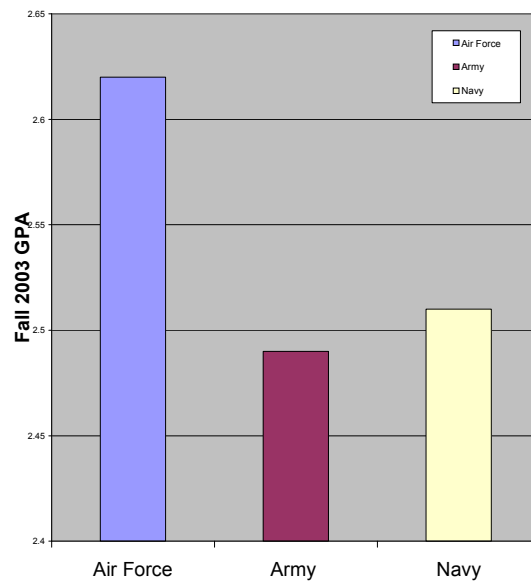


Figure 3. Average GPA

The Air Force ROTC students, who did more of the weekly assessments and showed better effort in their scores (Figure 2), did indeed achieve a higher average GPA than the Army and Navy ROTC students (Figure 3).

Correlating GPA with Weekly Assessment Scores and Individual Items Scores

The weekly assessments (Figure 1) from the 500 Texas A&M University ROTC students provided very detailed data regarding what students did each week throughout the semester to apply themselves academically. The total score on the weekly self-assessment will be called the “Academic Effort Parameter”. It is interesting to determine how well students’ Academic Effort Parameter correlates with their semester GPA. The scatter in such an exercise will be large because the students vary widely in their natural ability, their preparation as incoming freshmen, and their majors (which require very different levels of effort). It is difficult to control for these hidden variables. Because it is of interest to examine only the contribution of students’ time management and study habits to their success, corrections for differences in natural ability and prior academic preparation were made. A correction factor for aptitude using incoming SAT/ACT scores and a known GPA-aptitude test correlation based on prior studies done at other universities was used.⁵ In addition, it is generally recognized that high school preparation plays a significant role in the first year academic experience. The high school correction factor used was created based on the percentage of students from the student’s high school who go on to a 4-year university, with the assumption being that high percentages correlate with better overall preparation. The relationship between this factor and freshman GPA was quite strong (much greater than high school rank in class) and improved the overall correlation coefficient. The results of the academic effort parameter (normalized to 0.0-1.0), on GPA are present in Figure 4.

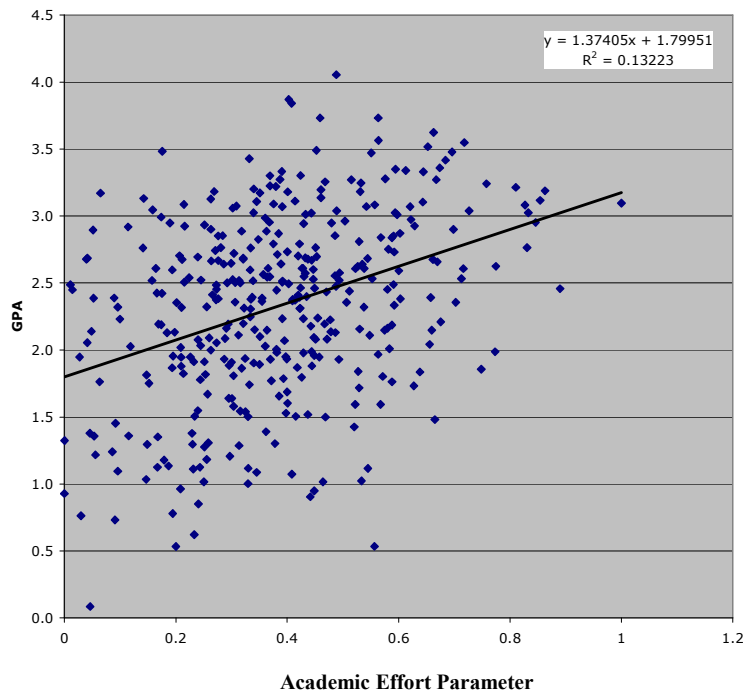


Figure 4. GPA versus Academic Effort Parameter (normalized)

It is also of interest to determine the relative importance of the each factor in the assessment and to assign a weighting factor to each one. Therefore, the GPA versus weekly average for each individual item in the assessment (rather than the total score) was graphed, with the slopes summarized in Table 2. The weighting factors were then determined as a ratio of the various slopes and indicate the relative importance of the various activities that are encouraged in the seminar and reinforced in the weekly assessment. It is worth noting that very few of the ROTC students in this 4th study were engineering students. Thus, some factors one might expect to be more important to the success of engineering students did not rank as high as one would expect (e.g., hours spent studying, reading book ahead of time).

Table 2. Relative importance of principles taught in S4S to Academic Success

Activity	Slope	Ratio	Weighting Factor
Sitting in front of class	0.74	1.00	8.40%
Stayed current in my understanding	0.72	0.97	8.10%
Listened actively in class	0.69	0.93	7.80%
Reviewed notes before class	0.65	0.88	7.40%
Class attendance	0.65	0.87	7.30%
Followed weekly schedule	0.62	0.83	7.00%
Update daily schedule	0.59	0.80	6.70%
Used reading techniques	0.58	0.78	6.60%
Prepared schedule prior/early in week	0.57	0.77	6.50%
Total hours spent in class and studying	0.57	0.77	6.50%
Used memory techniques	0.55	0.74	6.20%
Treated school like an 8-5 job	0.55	0.74	6.20%
Read book before material is covered in class	0.52	0.70	5.90%
Average hours of sleep	0.47	0.63	5.30%
Used note taking techniques	0.33	0.45	3.80%

Summary

These studies have demonstrated that a three-hour time management and study skills seminar combined with twelve weeks of Internet-based follow-up can significantly impact the GPA of freshmen students and increase retention in engineering.

The ROTC program at Texas A&M University required all 550 freshmen to take *Success4Students* the first week of the spring semester 2006 to determine whether it is more effective when offered in the fall or the spring of the freshmen year. Fall would seem to be a more logical time, but students' felt need for the program is often enhanced by one (often academically painful) semester in college.

Baylor University's engineering program continues to require that every freshmen engineering student take *Success4Students* the first week of the fall semester. The ROTC program at Baylor also requires that all freshmen students with scholarships take the program.

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