Freshmen Engineering Student Personal Attribute Workshop Findings: A Retention Issue

Prepared by Ronald J. Bonnstetter, Ph.D. & Bill J. Bonnstetter, M.A.

Executive Summary

This report compares the behaviors and values of all Fall 2007 University of Nebraska Lincoln freshmen engineering students against their first semester GPA. **The hypothesis was that these two databases would predict success and failure for many of these students, unless the identified group adapted for success and altered their study habits.** Both instruments were administered within the first two weeks of the semester and were followed by a one-hour presentation, covering primarily their behavioral instrument findings and the implications of several patterns where retention in the engineering program could be a concern.

As retention continues to be a growing problem, findings confirm that the UNL Engineering College is losing a large portion of students that have the potential of being entrepreneurs, sales people or managers. While some of these findings suggest that students are failing to adapt to the culture, another implication suggests that the freshmen engineering program is failing to address the needs of all incoming students by offering experiences targeted at only a few behavioral styles.

The report concludes with recommendations for both students and engineering program areas. Recommendations include: targeted mentors assigned to especially "at risk students;" greater time and effort at not just pointing out the behaviors and value implications, but providing specific study habit changes with specific action-plan requirements; and lastly, recommendations to include more engineering experiences that address the needs of those students who are not at present finding a home in the existing engineering culture.

Research Design

All incoming freshmen engineering students at UNL are required to participate in a one-credit, semester-long seminar that is designed to acclimate them to the fields of engineering. During their first fall of 2007 meetings, students were asked to go online and complete two personal attribute instruments. The following week, a one-hour presentation entitled "Adapting for Success" was given that described the instruments, the group findings, and made specific study habit recommendations.

In January of 2008 data from 558 students were conversed into Excel files for analysis by SPSS. Final cumulative grade points for each student were collected and added to the file. Student data was then grouped by GPA to examine if any different patterns of behaviors and or values could be identified. Groupings included students with a 4.0, 3.5-3.99, 3.0–3.49, 2.5–2.99, 2.0-2.49, under a 2.0 but not zero, and lastly, those with a 0 GPA after their first semester.

Part One: Behavioral Styles
First Instrument Employed: DISC

The first instrument "DISC" is a product of Target Training International, Ltd. (TTI). *"The Universal Language DISC: A Reference Manual,"* published by TTI, states that DISC "is the language of 'how we act,' or our behavior. Research has consistently shown that behavioral characteristics can be grouped together into four quadrants, or styles. People with similar styles tend to exhibit specific types of behaviors common to that style – this is not acting. A person's behavior is a necessary and integral part of who they are. In other words, much of our behavior comes from 'nature' (inherent), and much comes from 'nurture' (our upbringing). The DISC model merely analyzes behavioral styles—that is, a person's manner of doing things."

The acronym, DISC, stands for:

D - Dominance: Challenge
How you respond to problems and challenges.

I - Influence: Contacts
How you influence others to your point of view.

S - Steadiness: Consistency
How you respond to the pace of the environment.

C - Compliance: Constraints
How you respond to rules and procedures set by others.

The TTI Style Insights® instrument is based on William Moulton Marston's *"Emotions of Normal People."* As stated by Marston, "All people exhibit all four behavioral factors in varying degrees of intensity." Therefore, each behavioral factor may be exhibited along a continuum from high to low, thus creating eight extremes. It is this degree of intensity and the relationship with known intensities required of a student that was the bases of many of the workshop recommendations. Figure 1 provides a descriptive word list for this continuum by defining behaviors representative of each end of the spectrum and intermediate terms as well.

Figure 1 – DISC Descriptors

High D	High I	High S	High C
Demanding	Effusive	Phlegmatic	Evasive
Egocentric	Inspiring	Relaxed	Worrisome
Driving	Magnetic	Resistant to Change	Careful
Ambitious	Political	Non-demonstrative	Dependent
Pioneering	Enthusiastic	Passive	Cautious
Strong-Willed	Demonstrative	Patient	Conventional
Forceful	Persuasive	Possessive	Exacting
Determined	Warm	Predictable	Neat
Aggressive	Convincing	Consistent	Systematic
Competitive	Polished	Deliberate	Diplomatic
Decisive	Poised	Steady	Accurate
Venturesome	Optimistic	Stable	Tactful
Inquisitive	Trusting		Open-Minded
Responsible	Sociable		Balanced Judgment
Low D	**Low I**	**Low S**	**Low C**
Conservative	Reflective	Mobile	Firm
Calculating	Factual	Active	Independent
Cooperative	Calculating	Restless	Self-Willed
Hesitant	Skeptical	Alert	Stubborn
Low-Keyed	Logical	Variety-Oriented	Obstinate
Unsure	Undemonstrative	Demonstrative	Opinionated
Undemanding	Suspicious	Impatient	Unsystematic
Cautious	Matter-of-Fact	Pressure-Oriented	Self-Righteous
Mild	Incisive	Eager	Uninhibited
Agreeable	Pessimistic	Flexible	Arbitrary
Modest	Moody	Impulsive	Unbending
Peaceful	Critical	Impetuous	Careless with Details
Unobtrusive		Hypertense	

In addition, the TTI instrument is designed to identify both a "basic style" or preferred behaviors as well as a set of "adapted styles" or behaviors one exhibits when venturing into the real world of work or daily interactions.

Behavior Findings

While the same research questions were asked of both values and behaviors, each instrument will be discussed separately and then combined implications will be discussed. This is also being done because a greater correlation with behaviors was predicted. **Part One is confined to behaviors only.**

Research Questions: Identify & Compare Engineering Students to the General Population & Another Workplace Culture, such as Business Majors

It is important to realize that when studying any group associated with a profession, one would expect to see patterns unique to that profession. While these students are not yet professional engineers, a comparison to a 2006 random sample of the national workforce shows how they differ as a group. To further depict this difference, a group of college-age business majors taking a sales class has been included to demonstrate how behaviors within specific fields of study can differ. Figure 2 shows the primary behavior (plot point furthest from the midline) by percentage for each population. By combining the four high percents and the four low percents, 100 percent of a particular grouping is identified.

Figure 2 – Primary Behaviors for Several Populations

	High D	High I	High S	High C
National*	12%	20%	31%	5%
Engineering**	14%	9%	16%	22%
Business***	14%	19%	16%	12%
	Low D	**Low I**	**Low S**	**Low C**
National	11%	8%	1%	12%
Engineering	10%	16%	6%	8%
Business	20%	5%	3%	11%

** National Workforce sample of 275,713*
*** 2007 incoming Freshmen Engineering Students with 478 behavioral instruments.*
**** Comparison business major sales & marketing class with 129 students.*

Just from a descriptive point of view, one can see that the UNL engineering incoming freshmen class differs from national norms by having far fewer high I's and S's and over four times more high C's. **This suggests that those entering the engineering program, on average, are far more quality conscious then the national workforce or business sales students and as a group are less people- and activity-oriented.** As one might predict, business sales students as a group have far more high I's and low C's. Please refer back to Figure 1 for word descriptors to further explain these differences.

While comparisons with outside the culture difference are interesting, the major finding of this study comes to light when examining the engineering class data by end of first term grade points. To set the stage for this discussion, Figure 3 provides a general overview of the first term cumulative grade point averages for these students. When examining issues of retention, it is important to note that over one-quarter of the incoming class received a 2.0 or less. **More importantly, well over half of these failures were predicted based on the behavioral data.**

Figure 3

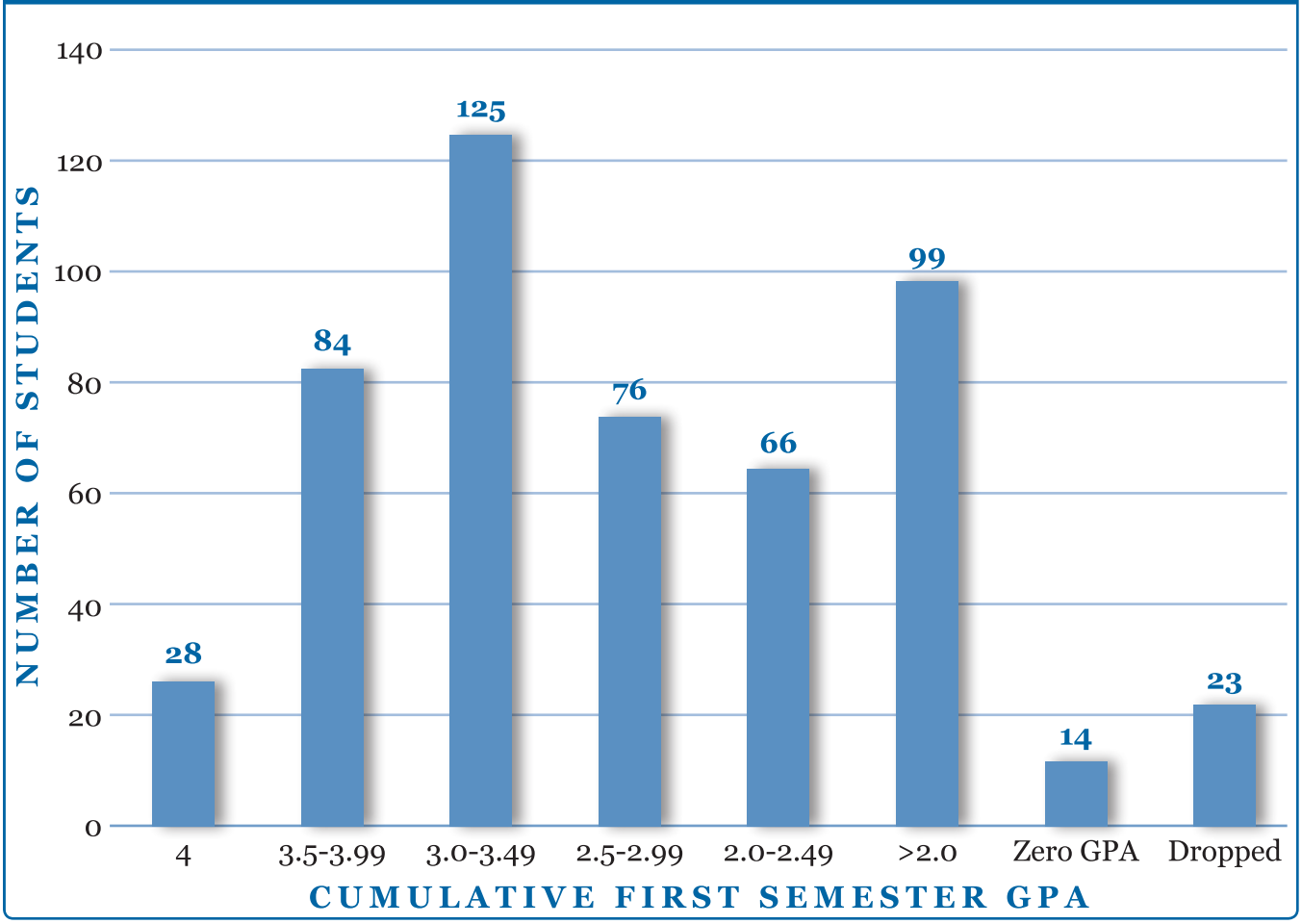


Figure 4 – Dominate Behaviors for Different GPA Rankings				
End of term cumulative GPA*	**High D**	**High I**	**High S**	**High C**
4.0	14 %	7%	18%	29%
3.5 – 3.99	15 %	8 %	14 %	26 %
3.0–3.49	14 %	5 %	17 %	24 %
2.5 – 2.99	18 %	8 %	21 %	16 %
2.0 – 2.49	15 %	6 %	17 %	23 %
> 2.0	10 %	17 %	12 %	18 %
Zero GPA	22%	11%	11%	19%
All Engineering Students	14%	9%	16%	22%
	Low D	**Low I**	**Low S**	**Low C**
4.0	18 %	4 %	4 %	7 %
3.5 – 3.99	11 %	17 %	4 %	5 %
3.0 – 3.49	8 %	19 %	6 %	7 %
2.5 – 2.99	9 %	14 %	4 %	9 %
2.0 – 2.49	3 %	17 %	9 %	11 %
> 2.0	14 %	14 %	6 %	8 %
Zero GPA	11%	5%	8%	14%
All Engineering Students	10%	16%	6%	8%

**The number of students in each GPA grouping may be found using Figure 3.*

Figure 4 exposes many of the differences that exist within different GPA rankings. The table breaks down the percentage of students in each grade point grouping by listing their dominate or largest movement from the center point of all four behavioral quadrants. In other words, each student has one dominate or plot point farthest from the midpoint. This information puts them into one of eight quadrants. By combining the four high percents and the four low percents, 100 percent of students in a particular grade point grouping are identified. In the case of the final row, all engineering students are grouped. As a result, we see that the largest dominate behavior representative of this incoming class was high C, followed by high S, then high D and low C at 14% each, then low D, low S, high I and finally a low I.

If the job of being an engineering major were to be benchmarked, there is little doubt that the job would be classified as a high C position. So it should be no surprise that 61% of students with a 3.0 or better also had high C as there dominate behavioral style compared to only 20% of the 2.0 or less students. A low I may well be just as important a predictor of a high grade point as the C factor. Sixteen percent of those students with a 3.0 or better also had a low I as

their dominate style, while only 12% of the 2.0 or less students had a low I. In contrast, we find that lower grades correlate with higher I scores. Fifteen percent of students with less than a 2.0 had high I as their dominate behavior, while only 6.3% of students with a grade point of 3.0 or better had high I dominance. Words that describe the high I group include: sociable, talkative, emotional, personable, good mixer, popular, and confident. So while the high C students were working for perfection, the high I students were socializing, confident that their old high school success would no doubt follow them into college. Similar concerns can be seen when comparing the S and D styles. Many of these grades suggest that students were not adapting for success.

Appendix A includes a more detailed statistical analysis of these GPA comparisons, including gender specific tables. What, of course, is missing is the fact that individuals cannot be standardized. A point that may well explain the loss of over one-third of this group after only one semester.

Based on previous benchmarked engineering jobs and on the merging patterns of success within this data set, the ideal behavioral success pattern is a high C and high S and a low D and low I. Figure 5 shows the natural styles for students with a GPA of 3.5 or better. The shaded cells, representing the numbers of students demonstrating the ideal style, shows that 68% of the students with 3.5 or better came into the engineering program with this behavioral style as their natural behaviors. Only 32% of this high GPA grouping had an inverted style. Figure 6 provides the same behavioral patterns for students with a GPA of 2.0 or less. Here we find 59% with the ideal pattern and 41% with a high D and I and low S and C. While there is a difference, Appendix A will show that the difference is not statistically significant. But a clearer image of the problem emerges when we examine the adapted styles of these two GPA groupings.

Figure 5 – High GPA Natural Behavioral Patterns
(Highlighted area = 68% with Ideal Behavioral Style)

End of term cumulative GPA*	High D	High I	High S	High C
4.0	4	2	5	8
3.5 - 3.99	13	7	12	22
	Low D	Low I	Low S	Low C
4.0	5	1	1	2
3.5 - 3.99	9	14	3	4

**4.0 GPA = N of 28*
**3.5-3.99 GPA =N of 84*
**Total of 112 students with 3.5 or better*

Figure 6 – Low GPA Natural Behavioral Patterns (Highlighted area = 59% with Ideal Behavioral Style)				
End of term cumulative GPA*	**High D**	**High I**	**High S**	**High C**
2.0 or Less	10	17	12	18
	Low D	**Low I**	**Low S**	**Low C**
2.0 or Less	14	14	6	8

**2.0 GPA or Less = N of 99*

A closer examination of the adapted behaviors found in Figures 7 and 8 shows a fascinating trend that must be examined. You may recall that the natural style represents those behaviors that a student naturally possesses and brings with them to the job. In this case, the job of being a student. The adapted style is the real set of behaviors they employ to do the job. If the job requires skills that do not come naturally, then the student must be able to adapt for success. When looking at the percentage of high GPA students with the preferred style of high S and C and low D and I, we now find 74% of the students with top grades were demonstrating these ideal behaviors and only 26% of the group were able to succeed without these skill sets. Therefore, the top students contain an additional 6% of students who adapted for success.

Figure 7 – High GPA Adapted Behavioral Patterns (Highlighted area = 74% with Ideal Behavioral Style)				
End of term cumulative GPA*	**High D**	**High I**	**High S**	**High C**
4.0	1	3	5	11
3.5 - 3.99	10	10	15	26
	Low D	**Low I**	**Low S**	**Low C**
4.0	4	2	5	8
3.5 - 3.99	13	7	12	22

**4.0 GPA = N of 28*
**3.5-3.99 GPA =N of 84*
**Total of 112 students with 3.5 or better*

Figure 8 – Low GPA Adapted Behavioral Patterns (Highlighted area = 54% with Ideal Behavioral Style)				
End of term cumulative GPA*	**High D**	**High I**	**High S**	**High C**
2.0 or Less	21	18	20	15
	Low D	**Low I**	**Low S**	**Low C**
2.0 or Less	10	8	2	5
**2.0 GPA or Less = N of 99*				

Figure 8 provides an overview of the adapted styles of those students who basically failed as first semester engineering students by having a GPA of 2.0 or less. So while the top students were picking up an additional 6% of students with the ideal behaviors, the failing students actually adapted styles that were the opposite of the ideal by ending up with only 54%. 46% of the failing students demonstrated behaviors of a high D and I and low S and C. By revisiting the descriptions previously provided, one can quickly see why their failure was predictable. Please examine Appendix A for more detail concerning specific adapted styles and GPA significant.

Figure 9 – Percent of Students with Preferred or Ideal Behavioral Pattern (High C&S, Low D&I)		
GPA Grouping	**Percent with Natural Ideal Style**	**Percent with Adapted Ideal Style**
4.0	68%	74%
3.5 – 3.99	68%	69%
3.0 – 3.49	68%	71%
2.5 – 2.99	60%	66%
2.0 – 2.49	60%	59%
2.0 or less	58%	53%
Zero GPA	46%	56%

Figure 9 shows how these natural and adapted ideal styles change as GPA decreases. The table shows that as GPA goes down, the students were less likely to adapt for success by demonstrating the ideal behavioral style.

Correlations to Soft Skills

A recent study completed by TTI compared DISC and a soft skill instrument called TTI DNA®, which lists 23 work-related skills and rank orders a person's level of mastery of these skills. Based on GPA, we have shown that the ideal student would possess a behavioral style of high C & S and low D & I. When only examining this ideal, we find the following correlations.

High C & S soft skills correlations:

- Planning and Organization
- Self-Management

When examining the high D & I correlations, we find NEGATIVE correlations with:

- Planning and Organization
- Self-Management

Simply stated, the more you adapt to the ideal behaviors, which translates to effective study habits, the better your engineering grade point. **The key is adapting.** The high D and I students need help to first identify these deficits and then help to learn how to adapt these new skills. These skills can be learned behaviors, but only when the person recognizes the need and is given a clear path for development.

But the study also found a set of negative correlations for both the high C and high S. What skills might a class of high C, high S students be lacking? Or what might an engineering firm with only high C and S employees be missing from their teams?

The following soft skills were found to have NEGATIVE correlations with high C:

- Interpersonal Skills
- Leadership
- Persuasion
- Flexibility
- Decision Making
- Personal Effectiveness
- Creativity & Innovation

NEGATIVE correlations found with the high S:

- Personal Effectiveness
- Leadership
- Decision Making
- Management
- Goal Orientation
- Negotiation
- Persuasion
- Presenting
- Creativity & Innovation

While the high C and S combination certainly provides skills related to effective study habits, an organization composed of only high C & S risks the lack of many crucial soft skills. Soft skills needed in engineering maybe more now than ever before.

Educational programs and businesses must ensure that they have a well balanced team. All styles must find a home. And yes, all must adapt at times to meet specific job-related challenges.

Reflection & Comment

As stated during the initial workshop, the concern was that high I students would spend too much time socializing and not enough time on their studies. High D students would not have the required sense of urgency necessary to stick with their projects and would feel that their own perception of quality and completeness was the only judgment needed. It was predicted that high S students and especially high C students would receive the highest grade points. This not only relates to the fact that compliance and steadiness are required for success as a student, it is believed that if the job of being an engineering student was benchmarked, a patented process created by TTI, the job would be classified as a high C task.

It is at this point that several program recommendations are offered. The first is obvious, that greater awareness of these behavioral stumbling blocks need to be provided to students. While awareness may have been accomplished during the fall of 2007 workshop, not nearly enough time was spent on behavior-specific study habit recommendations. A set of these recommendations intended to be used in future workshops may be viewed in Appendix B.

The next recommendation may be much harder to implement. The lack of success for high I and D students, as judged by GPA, is not only tied to their failure to adapt to the high S and C work environment, it is a direct reflection of the kinds of experiences provided by the present program. If one were to consider for a moment a program that sought to provide experiences that all styles would find ways to be successful, the following changes would be required. Freshmen students would have more group and team projects, where the high I students could use their skills of communication to interact and develop a closer tie to the material being presented. Next, more open-ended and challenging problems would be employed so the high D students could employ their skills of problem-solving in dealing with real world issues.

One is left with the impression that there is no place in the existing freshmen program for creative problem-solving or group interaction. **This would be fine if it were not for the fact that this data suggests that UNL is losing many high I and D students long before they have a chance to experience these crucial aspects of engineering.** Just like a well-balanced research team must have individuals with different talents, our programs need to create opportunities for all styles. A graduating class composed of steady paced, compliant graduates may show high GPA, but the workplace also requires workers with creativity and massive communication skills.

In many ways, these insights have left us with more questions than answers, but knowing some of the questions is the first step to solutions. **Some of the questions generated included:**

- *Does the UNL program match the industrial needs, or does the program match the behavioral styles of their present teaching faculty?*
- *Should faculty accommodate for these differences or expect students to adapt?*
- *Would focused recruiting fore worn high I students and D students of the kinds of behaviors required?*
- *Would early knowledge of behaviors and values allow students to make better career choices?*
- *At this point all fields of engineering have been assessed as a unit, but will we find differences in behavioral styles and GPA if we assess by specific engineering majors?*
- *Maybe a new major is needed, such as Engineering Sales and Marketing, that better matches the skill set of some of the present incoming students.*

As a result of these comments, I would like to request that I be allowed to continue my work with incoming freshmen and to also have access to several other groups. In particular, it would be interesting to survey senior students to see the percentage of I students and D students compared to S students and C students. If my hypothesis is correct, we will have lost many of these students to other colleges, including the College of Business. I would also like to follow the 2007 freshmen over the next four to five years to see how they progress and collect more data around specific engineering majors.

Lastly, both a high I and a low C score are extremely strong indicators of pending grade doom. One is left wondering if the one-hour workshop that attempted to point out the need for these groups to adapt for success had any impact. At the time of the workshop, I actually dwelt more on the high I and high D mismatch with the job, than the low C concerns. I will need to use this data to drive home the need to adapt for success. But we may need to do far more than provide behavioral study habit guides. We may want to consider upper classmen mentors, who will not only be knowledgeable of pending course work and program expectations, but will be trained in DISC and values so they could serve as new student professional coaches.

We look forward to your reaction to this report and are ready to meet and discuss implications and applications at your convenience.

Part Two: Values Inventory
Second Instrument Employed: PIAV

The second instrument administered was the "Personal Interests, Attitudes and Values" or PIAV, another instrument from TTI. The history of this tool dates back to 1928 when Edward Spranger identified six attitudes that exist in the workplace. According to Spranger, these attitudes define the "why" of your actions. You move into action based on what you value; you pursue what you value. You will tend to be negative or indifferent toward experiences and people whose "valuing" is opposite of yours. Of the six attitudes observed by Spranger, the top two will move you into action. **TTI's assessment, based on the Spranger model, rank orders your values based on:**

- If you value knowledge and the search for truth **(Theoretical attitude)**,
- If you value form, harmony, beauty and balance **(Aesthetic attitude)**,
- If you live by a closed system of principles **(Traditional attitude)**,
- If you have a passion to lead, direct and control others **(Individualistic attitude)**,
- If you have a humanitarian drive: a desire to eliminate pain and conflict in the world **(Social attitude)**,
- If you seek an environment that rewards return on investment of time, talent and resources **(Utilitarian attitude)**.

Values Findings:
Identify the Mean & Mode for the Six Values

Figures 10, 11 and 12 describe the values of the entire 2007 freshmen engineering class. The data indicates a strong theoretical tendency, followed closely by a utilitarian value. As a group, aesthetics is the weakest value.

The large number of students with Theoretical as their number one value is an extremely important factor in their chosen field of engineering. First of all, this value is a driving force for them to learn and more importantly, it is a driving force for life-long learning. As the fields of engineering change, we need professionals who value learning and are willing to embrace new knowledge. Secondly, their strong Utilitarian value will serve them well as they make professional decisions, especially concerning financial security. Over 20 years of research on secondary science education majors finds the utilitarian value ranked fifth out of six. The co-author of this report calls the decision to be an educator, "Planned Poverty".

The other ranking of note is the low social chosen as their number one value. Previous work on the field of education finds over 85 percent of teachers placing "social" as one of their top three values. Again, when one examines the definition of the social value, you would expect our educators to have a humanitarian drive. Maybe the words of wisdom here at least is to not put this group of engineering students in charge of environmental issues, unless the goal is to simply learn all they can about the problem or to make money from the problem. A similar comment could be made about the low Aesthetic. But again, that score is predictable.

Figure 10 – Number One Value Chosen by 2007 Freshmen Engineering Students

Value	*Freshmen Percentage	**National Percentage
Theoretical	56.95%	16.00%
Utilitarian	24.62%	40.12%
Aesthetic	1.28%	2.75%
Social	8.70%	24.92%
Individualistic	4.06%	8.24%
Traditional	4.28%	7.96%

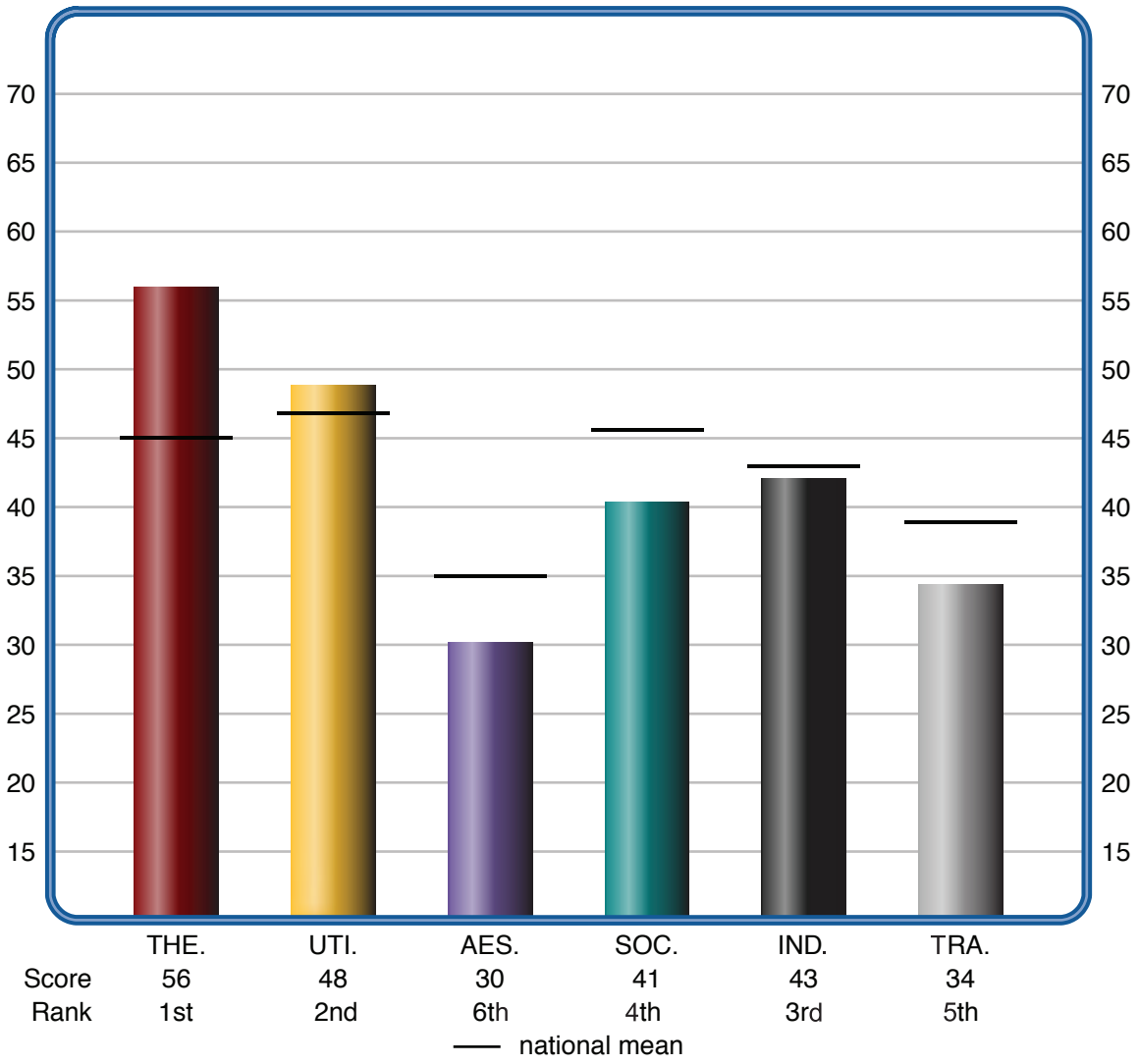
**N = 458 engineering students who completed the PIAV Inventory.*
***National sample of 49,994 who have recently taken the PIAV.*

Figure 11 – Descriptive Mean Scores for Values

Value	*Mean	Mode	Std. Deviation	**National Means
Theoretical	55.71	62	9.307	45
Utilitarian	48.45	57	11.026	47
Aesthetic	30.54	23	9.977	35
Social	40.63	41	9.868	46
Individualistic	42.63	45	8.416	41
Traditional	34.05	28	9.824	39

**N = 458 engineering students who completed the PIAV Inventory.*
***National Mean from 49,994 who have recently taken the PIAV.*

Figure 12 – 2007 Freshmen Engineering Class Values Graph



Appendix A

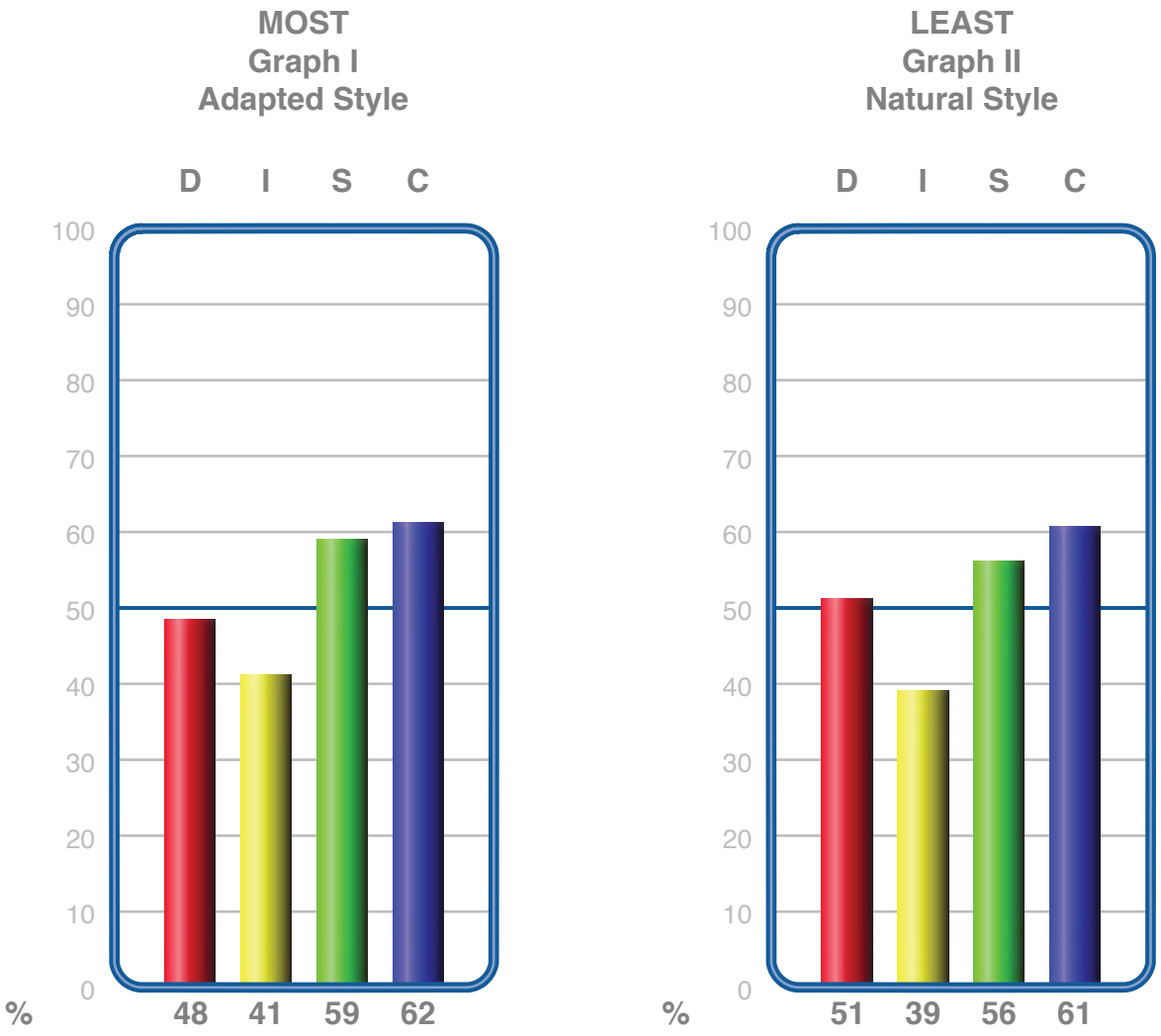
Further Assessment of Behaviors by GPA & Gender

As a group, the 2007 incoming Freshmen Engineering students exhibit "C" and "S" behaviors as seen in Tables 1 and 2. To further help the reader understand the extent and kinds of feedback that each student received, a composite printout based on the average group behaviors may be viewed in Appendix A. Any unique differences between the natural and the adapted styles are lost in the averaging process. Therefore, as a group, we see little change. Further analysis is required to see if subgroups, such as grade point groupings, will show different profiles.

Table 1 – Descriptive Data for Behaviors

Behavior	Mean	Mode	Standard Deviation	N
D - Natural	51.82	58	26.135	458
D - Adapted	48.48	29	26.356	458
I - Natural	42.59	74	27.728	458
I - Adapted	44.36	11	27.474	458
S - Natural	60.36	82	27.465	458
S - Adapted	61.69	51	24.820	458
C - Natural	61.19	51	28.499	458
C - Adapted	62.43	29	26.146	458

Table 2 – Descriptive Data for Behaviors DISC Graph



Identify the Average, Mean & Mode for the 8 Behaviors by Gender

While descriptive data for both genders may be found in Tables 3 and 4, due to the low number of females (58) verse 400 males, very few significant differences were noted. For this same reason, a break down of GPA by gender provided no additional information and is not presented.

Table 3 – Descriptive Behavioral Data for Males

Behavior	Mean	Mode	Standard Deviation	N
D - Natural	52.10	58	25.986	400
D - Adapted	48.68	20	26.673	400
I - Natural	41.57	74	27.532	400
I - Adapted	43.60	41	27.273	400
S - Natural	60.76	82	27.421	400
S - Adapted	61.67	51	24.876	400
C - Natural	61.52	75	28.239	400
C - Adapted	62.59	51	26.094	400

Table 4 – Descriptive Behavioral Data for Females

Behavior	Mean	Mode	Standard Deviation	N
D - Natural	49.90	64	27.298	58
D - Adapted	47.09	29	24.229	58
I - Natural	49.57	39	28.307	58
I - Adapted	49.64	30	28.508	58
S - Natural	57.59	56	27.850	58
S - Adapted	61.83	82	24.641	58
C - Natural	58.90	51	30.392	58
C - Adapted	61.36	72	26.711	58

Is There a Difference Between Any of the Behaviors, Based on GPA?

Table 5 indicates that there are significant differences between GPA groupings and the adapted I and C. Seven separate GPA groupings were created. The groups were identified as students with a 4.0, 3.5-3.99, 3.0–3.49, 2.5–2.99, 2.0-2.49, under a 2.0 but not zero, and lastly, those with a 0 GPA after their first semester of college. In other words, these grades are the cumulative GPA at the end of these freshmen engineering students' first full semester of college. A follow up post hoc test was run to clarify which GPAs correlate to these shifts. **Please refer to Tables 7 and 8 to identify the specific significant correlations.**

Table 5 – One Way Anova for Behaviors versus GPA			
Value	**Degrees of Freedom**	**F Value**	**Significance**
D - Natural		0.910	0.487
Between Groups	6		
Within Groups	451		
I - Natural		1.758	0.106
Between Groups	6		
Within Groups	451		
S - Natural		1.041	0.398
Between Groups	6		
Within Groups	451		
C - Natural		1.545	0.162
Between Groups	6		
Within Groups	451		
D - Adapted		0.712	0.640
Between Groups	6		
Within Groups	451		
I - Adapted		2.352	0.030
Between Groups	6		
Within Groups	451		
S - Adapted		1.016	0.414
Between Groups	6		
Within Groups	451		
C - Adapted		3.970	0.001
Between Groups	6		
Within Groups	451		
P < .05			

Follow-up Comparison of Grade Point & Behaviors

Table 6 reveals a major set of GPA success predictors. The table shows that students as a group who received a drop out GPA of zero had a significantly higher I behavioral score than students with a GPA of 3.0 to 3.49. Even more dramatic is the correlation between drop out scores and C behavioral values. Three correlations are found with zero and any group with a GPA of 3.0 and higher plus students with below a 2.0 also had a significantly lower C value than did the 4.0 students.

Another interesting outcome is that only the adapted behaviors were significantly different. Which would suggest that the natural styles were similar between GPA groupings, but that the successful GPA students adapted to a greater extent.

Table 6 - Tukey Post Hoc Test for GPA and Behaviors Showing only Significant Comparisons

Dependent Variable	GPA Comparison	Mean Difference (First GPA minus the second)	Significance
I - Adapted	Zero & 3.0-3.49	26.925	0.044
C - Adapted	Zero & 3.0-3.49 Zero & 3.5-3.99 Zero & 4.0 < 2.0 & 4.0	Minus 26.808 Minus 28.586 Minus 37.670 Minus 18.843	0.027 0.017 0.002 0.015

Correlations for Grade Point Averages on Behavioral Responses which Scored 75 or Higher & for those with 60 or Higher

With high I and D scores having been found to correlate with GPA, Tables 7 and 8 simply confirm the expected GPA by style. The lowest GPA goes to those with a high natural I, followed by our high D students, then S and the top grades belong to the high C group. This same trend is found in both the 60 and 75 and greater groupings.

Table 7 – Behavior Assessment for Students with Behavior Sub-scores Greater than 75

Behavior	N out of 458	Mean GPA	Standard Deviation
D - Natural	95	2.6	1.122588
D - Adapted	103	2.5	1.077219
I - Natural	49	2.4	1.101868
I - Adapted	74	2.6	1.031770
S - Natural	164	2.8	0.989610
S - Adapted	190	2.7	0.968829
C - Natural	195	2.9	0.919152
C - Adapted	184	2.9	0.946990

Table 8 – Behavior Assessment for Students with Behavior Sub-scores 60 or Greater

Behavior	N out of 458	Mean GPA	Standard Deviation
D - Natural	179	2.64	1.061398
D - Adapted	171	2.67	1.020854
I - Natural	157	2.57	1.071867
I - Adapted	127	2.58	1.073413
S - Natural	231	2.78	0.955927
S - Adapted	236	2.75	0.950148
C - Natural	274	2.78	1.008897
C - Adapted	280	2.83	0.930473

Appendix B
Study Habit Recommendations

Note to Student:
After reading your study tips, select two or three tips and incorporate the ideas into your study habits. Remember, the list of recommendations for your low scores are just as important as the help for high scores.

Help for High D Students
- Plan ahead—don't put off completing assignments until the last minute.
- Set up an area in your room for studying only.
- Work on your listening skills.
- Organize your study area and keep it organized.
- Break big assignments into smaller units.
- Think visually—convert words into pictures.

Help for High I Students
- Don't doodle.
- Use short sentences when taking notes—leave out unnecessary words.
- Review your notes after class.
- Listen for ideas and the facts to support the idea.
- Review notes from previous class to prepare yourself for the class.
- Take vigorous notes.
- Analyze your time and see how you are spending it.
- Socialize after studying—not before.

Help for High S Students
- Think positive about new ways to learn.
- Meditate and think positive before taking an exam.
- Set goals that are realistic.
- Probe yourself and others about ideas you are learning.
- Put words you have trouble spelling on your mirror.
- Study in groups of two or more.
- Plan a block of time for studying—take 10 minute breaks every hour.
- Study and review just before class starts.

Help for High C Students

- Listen and think positive about the subject and the teacher.
- Study alone.
- Set goals that are challenging.
- Think positive about your ability to pass every class with high marks.
- Join in on class discussion.
- Ask yourself questions—either from the book or ones you make-up.
- Volunteer to answer questions in class.
- Make sure you understand instructions before leaving class.

Help for Low D Students

- Ask questions on things you are unsure about.
- Identify the time of the day you feel best and try to fit studying into these hours.
- Set goals that challenge your abilities.
- Don't let others invade your study time.
- Study or review just before class starts.

Help for Low I Students

- Listen for ideas and think how they may apply to your future.
- Think positive about each class and display your interest by your facial expressions.
- Break your habit of studying alone and study with friends.
- Don't listen so critically that you miss the intended ideas.
- Plan your study week on Sunday.

Help for Low S Students

- Determine the grade you want in each class before the term begins and study accordingly.
- Set aside time to plan.
- Write detailed instructions for each class assignment.
- Use the library for studying when possible.
- Do only one class assignment at a time.
- Underline or highlight when you read; make study notes.
- Cut down on some of your activities and devote this time to studying.

Help for Low C Students

- Don't let your ego keep you from studying.
- Use recitation to embed facts and ideas.
- Think positive about teachers and subjects that give you difficulty.
- Don't put off studying until the last minute.
- Develop good study habits and follow them everyday.
- Read a book on listening and note taking.