They Come and They Go -- An Instrument for Assessing Why Students Leave Engineering

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Abstract

This paper describes a new quantitative data collection instrument for collecting profile information (e.g. academic preparation, reasons for choosing engineering, participation in academic support and extracurricular activities) and measuring the factors that influenced students’ decision to switch out of an engineering degree program. We also report the results of a pilot data collection effort of 120 students from five institutions in the U.S. who left engineering during the 2003 – 2004 academic year.

Introduction

The latest figures (NSF, 2004; U.S. ED/NCES 2000) show that attrition rates in the sciences and engineering are still an area of concern. Retention of engineering students is a primary goal of most Women in Engineering (WIE) and Minority Engineering (MEP) programs.

As project leaders of the NSF-sponsored Assessing Women in Engineering project (NSF # 0120642), we have recently developed a new assessment tool for gathering valid data on the reasons students decide to transfer out of engineering. Prior work from Seymour and Hewitt (1997) and Brainard and Carlin (1998) provided our communities with results essential to developing an understanding of why students from those institutions during that time period chose to leave engineering. However, WIE, MEP, college of engineering administrators and faculty have an ongoing need for these data from their own institutions. This paper will report the results of a preliminary study using the instrument as well as describe the instrument, how it was developed and how it may be used by others.

Background and Related Literature

The latest figures (NSF, 2004; U.S. ED/NCES 2000) show that attrition rates in the sciences and engineering are still an area of concern. Retention of engineering students is a primary goal of most WIE and MEP programs. WIE and MEP programs focus primarily on creating support activities to retain students, however when students do switch from engineering it is important to gather data about what influenced that decision. Identifying the factors that contribute to these decisions to leave is an important focus area for not only WIE and MEP programs but also engineering units in general.
Brainard and Carlin (1998) summarize some of the important findings in this area of inquiry. Seymour and Hewitt (1997) in their comparative study of science students who persist and those who do not found that there were no real differences in the factors of high school preparation, ability, or effort expended in their coursework between students who remain and those who switch. These results have been confirmed to apply to women science engineering students by other studies (Ginorio, 1995; Laurich-McIntyre & Brainard, 1995). Seymour and Hewitt also identified two categories of students who leave science / engineering programs: those who become bored or disappointed with the curriculum and those who feel they must leave because of a loss of academic self-confidence in the competitive environment. Further, Seymour and Hewitt’s (1997) found that women and students of color – marginalized populations – were in this second category.

Adelman’s (1998) ground breaking report of men and women in the engineering path analyzed the path that engineering students followed to both cross an initial “threshold” of studying engineering as well as completing an engineering degree where the “path” is defined in terms of actions and choices as recorded on high school transcripts, test scores and surveys of a nationally representative sample. This research methodology is in contrast to ones, such as Seymour and Hewitt (1997) that directly ask students to self-report their experiences and the factors that influenced their decisions. “Migrants” --those students who began an engineering curriculum but left before completion -- differ in the following ways:

- Women migrants performed statistically significantly worse than male migrants on the SAT/ACT.
- Women migrants performed statistically significantly worse than women who completed an engineering degree in a constructed measure of academic performance based upon GPA in academic courses and high school class rank.

Overall, Adelman (1998) and researchers McIlwee and Robinson (1992) observe that for women students in engineering “only the academically strongest are likely to survive” (p. 75).

These studies provide important baseline data regarding this issue however, they do not provide the overall WIE / MEP and engineering education community with a tenable means for collecting similar data for undergraduate students that leave engineering. Although Seymour and Hewitt’s (1997) interview protocol could be adapted from the original science student audience to engineering students, the feasibility of collecting and doing high quality analysis of such qualitative data is doubtful given the labor intensity and required skills of such analysis – neither of which are likely to be present in WIE, MEP or overall engineering unit staffs (Goodman, et al., 2002).

Additionally, and perhaps more importantly, all of these studies are somewhat dated. We say this not as a criticism – these studies were and are critically important in our field. However, the students who participated in these studies arguably experienced different high school environments and curricula and social norms and expectations than students – both male and female – do today. Thus there is a need for current data collection using a reliable and valid predominantly quantitative instrument. The AWE Students Leaving Engineering instrument is designed to meet this need. The authors hope that by making this instrument and the data it will provide available that MEP, WIE and engineering administrators will be able to make a case for
making the changes in engineering education curriculum and extra curricular activities that will alleviate the legitimate problems that students are encountering.

Methodology

Subjects

During spring 2004, preliminary data using an online version of the AWE Students Leaving Engineering instrument were collected from 120 students at five institutions: Penn State University (PSU), Georgia Institute of Technology (GT), University of Louisville (U. Louis.), University of Texas Austin (UT-A) and the University of Arizona (U. Ariz.).

Respondents were female students at our five participating institutions (one institution also collected data from males) who had already transferred from engineering or who had stated their intention to transfer from engineering. Table 1 shows the gender distribution of the students who responded.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT</td>
<td>36</td>
<td>0</td>
<td>36</td>
</tr>
<tr>
<td>PSU</td>
<td>19</td>
<td>33</td>
<td>52</td>
</tr>
<tr>
<td>U. Ariz.</td>
<td>8</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>U. Louis.</td>
<td>10</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>UT-A</td>
<td>14</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>87</td>
<td>33</td>
<td>120</td>
</tr>
</tbody>
</table>

These programs collectively represent a variety of years of experience for WIE directors and student body characteristics that provide a women engineering student sample that is largely representative of undergraduates studying engineering in the United States. Seventy-two percent (n = 87) of the student sample consisted of women and 28 % (n = 33) were men (all from PSU). There were 21 minorities in the sample, 16 women and 5 men.

Procedures

Directors of the WIE programs at each institution identified both students that had recently transferred out of engineering. Procedures for identifying these students included the following:
- Accessing data from an institutional office that tracks which students move from one academic unit or college to another.
- Accessing data from an engineering office that collects student requests to move from one academic unit or college to another.
- Manual comparison of lists of students enrolled in a prior year to those enrolled in the current year.
Several program directors noted that their methods for identifying students transferring out of engineering did not in fact identify all of the students. In some cases, institutions did not track students who were leaving the institution all together, or the engineering unit only tracked students transferring to selected colleges (e.g. business or arts and sciences), and clearly only PSU identified male students for this data collection. This is acceptable only because this was a pilot data collection process; these procedures will be made more robust and complete for subsequent data collection efforts.

Once identified, these students received an email explaining that the institution wished to gather data on their decision to transfer out of engineering. The online nature of the instrument allowed respondents to have access to the instrument whether they were on campus or not.

Instrument
The AWE Students Leaving Engineering (SLE) instrument is designed to meet the need for a quantitative instrument to collect data specifically on the background and the reasons engineering students decide to transfer out of engineering. In addition to gathering basic demographic data (e.g. engineering major student intended to complete, GPA, et.) the instrument gathers data on the following topics: reasons for initially pursuing an engineering major, high school preparation, intended transfer destination (e.g. which college, work, military), career plans, participation in college extra curricular activities, factors that impacted respondents decision to leave engineering including a rating of the significance of each contributing factor.

To create the instrument, we reviewed existing instruments for students switching majors, as well the interview protocols that were used in qualitative studies such as Seymour and Hewitt (1997). The ACT “Withdrawing / Non-returning Student Survey” is designed to provide “an in-depth look at students' reasons for leaving college before completing a degree or certificate program” (http://www.act.org/ess/postsec.html). As indicated by the name and the instrument description, this instrument is for students who are leaving college altogether, rather than transferring out a particular major. Although not directly appropriate for our target student audience, the reasons students have for withdrawing from college (e.g. financial, adequacy of departmental and university services) may also be contributing that may influence a student’s decision to transfer from a particular college.

To further inform our instrument development we reviewed the results of Seymour and Hewitt’s (1997) study of why students transfer out of science degrees. The resulting instrument incorporates their results and is supplemented by work that has specifically addressed the factors that influence retention in engineering (Adelman, 1998; Brainard and Carlin, 1998; Blaisdell, 1995).

Results and Discussion

The following are the most pertinent results from these data. We note that an analysis by gender was possible for only a portion of the results because of time limitations. Analysis by gender will be available at the conference presentation however we note that because male students completed the instrument at only one institution, the gender results may not be representative of
the participating institutions. Future data collection plans include collecting responses from male students at all participating institutions.

Descriptive Statistics and Frequency Results

- 93% of students were “traditional” college students and had just graduated from high school.
- Self-reported GPAs ranged from 1.82 – 4.0. There was no clear pattern to GPAs reported. The mode for the distribution was 3.0 with a frequency of 6.
- Most of the students had completed one or more AP or Honors courses during high school.
- Approximately 59% of respondents reported that high school had adequately prepared them for successfully studying engineering.

As Table 2 shows, reasons for majoring in engineering were well distributed over the categories provided with being good at math and science and desiring a well-paid job as being most frequently selected. These reasons reflect a similar distribution to those found by Seymour and Hewitt (1997) – especially the high frequency of students choosing engineering because of their math / science ability. The relatively low number that selected “like work that engineers do” is also notable. Seymour and Hewitt (1997) and Adelman (1998) comment on the lack of understanding of what engineers do as being a factor in both poor decisions to study engineering or science initially as well as recruiting potential students into engineering.

Table 2. Reported reasons for majoring in Engineering (Frequency / Category)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>93</td>
<td>Good at math or science</td>
</tr>
<tr>
<td>65</td>
<td>Like to build and/or fix things, or solve problems</td>
</tr>
<tr>
<td>11</td>
<td>Participated in engineering camp or workshop that influenced me</td>
</tr>
<tr>
<td>28</td>
<td>High school advisor or teacher suggested it</td>
</tr>
<tr>
<td>81</td>
<td>Wanted to be able to get a well-paying job after I graduate</td>
</tr>
<tr>
<td>10</td>
<td>Not sure</td>
</tr>
<tr>
<td>25</td>
<td>Like work that engineers do</td>
</tr>
<tr>
<td>38</td>
<td>Parents, other relatives or friend is an engineer</td>
</tr>
<tr>
<td>42</td>
<td>Parents, siblings or other relatives recommended it</td>
</tr>
<tr>
<td>38</td>
<td>Attracted by the challenge of a difficult curriculum</td>
</tr>
<tr>
<td>10</td>
<td>Received or anticipated possibility of good college scholarship</td>
</tr>
<tr>
<td>9</td>
<td>Other</td>
</tr>
</tbody>
</table>

Table 3 shows a low involvement in extracurricular activities for this group of students. Nearly 80% of the total responses were at the “no involvement” level in contrast to only 2% of responses at the “very involved” level.

Table 3. Involvement in Extracurricular Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>No Involvement</th>
<th>Somewhat Involved</th>
<th>Very Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  An engineering society (such as the American Society of Mechanical Engineers)</td>
<td>90</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>

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Table 4 shows the frequencies and percentages of students who attended the listed academic preparation activities at least once while they were studying engineering. All percentages are based on a total of 120 responses. In contrast to extra curricular activities, respondents did to some extent participate in typical academic activities such as attending review sessions (79%) and working with other engineering students to get help (72.5%). Data on the frequency of such activities was not collected.

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended review sessions before exams</td>
<td>95</td>
<td>79%</td>
</tr>
<tr>
<td>Sought help from other engineering students when I experienced difficulties in classes</td>
<td>87</td>
<td>72.5%</td>
</tr>
<tr>
<td>Visited or emailed an advisor or advising center</td>
<td>85</td>
<td>71%</td>
</tr>
<tr>
<td>Attended Engineering orientation prior to beginning classes</td>
<td>80</td>
<td>66.7%</td>
</tr>
<tr>
<td>Called or emailed parents or other close advisors about difficulties I was experiencing in classes or school</td>
<td>71</td>
<td>59%</td>
</tr>
<tr>
<td>Visited a professor and / or graduate assistant in her or his office hours</td>
<td>65</td>
<td>54%</td>
</tr>
<tr>
<td>Received tutoring for courses where I was experiencing difficulty</td>
<td>60</td>
<td>50%</td>
</tr>
<tr>
<td>Scheduled an appointment with a professor and / or graduate assistant outside of his or her office hours</td>
<td>43</td>
<td>36%</td>
</tr>
<tr>
<td>Visited the Career Center or Co-op Office to seek an internship or co-op position</td>
<td>28</td>
<td>23%</td>
</tr>
<tr>
<td>Got advice from a mentor in a formal mentoring program</td>
<td>18</td>
<td>15%</td>
</tr>
<tr>
<td>Attended summer program designed to prepare me to begin the engineering curriculum</td>
<td>14</td>
<td>11.6%</td>
</tr>
<tr>
<td>Participated in an undergraduate research experience</td>
<td>7</td>
<td>5.8%</td>
</tr>
<tr>
<td>Participated in formal or informal study groups</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 4. Academic Preparation Activities Ordered by Frequency (Percentage)

The destination colleges / areas of study to which students transferred are shown in Table 5, alphabetically. Science and technology (includes earth and mineral science, physical and
biological sciences, mathematics and industrial design), business and liberal arts / humanities account for 78 or 65% of the respondents. Note as well that only one respondent was planning on transferring to another institution.

Table 5. “Switchers” Destination Colleges/ Areas of Study

<table>
<thead>
<tr>
<th>College/Area of Study</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>3</td>
<td>2.50</td>
</tr>
<tr>
<td>Architecture/Landscape Architecture</td>
<td>5</td>
<td>4.17</td>
</tr>
<tr>
<td>Art / Fine Arts</td>
<td>3</td>
<td>2.50</td>
</tr>
<tr>
<td>Arts &amp; Science</td>
<td>9</td>
<td>7.50</td>
</tr>
<tr>
<td>Science &amp; Technology</td>
<td>25</td>
<td>20.83</td>
</tr>
<tr>
<td>Computer / Information Science</td>
<td>7</td>
<td>5.83</td>
</tr>
<tr>
<td>Business</td>
<td>30</td>
<td>25.00</td>
</tr>
<tr>
<td>Education</td>
<td>6</td>
<td>5.00</td>
</tr>
<tr>
<td>Liberal Arts / Humanities</td>
<td>23</td>
<td>19.17</td>
</tr>
<tr>
<td>Pre Law</td>
<td>1</td>
<td>0.83</td>
</tr>
<tr>
<td>Pre Med / Health Professions</td>
<td>4</td>
<td>3.33</td>
</tr>
<tr>
<td>Transferring to Another Institution</td>
<td>1</td>
<td>0.83</td>
</tr>
<tr>
<td>Undecided</td>
<td>3</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Table 6 shows the reported significance of 25 factors that may have contributed to the respondent’s decision to leave engineering. By observing the frequencies and via a subsequent calculation of percentage distributions for each factor, it appears the following were the most significant factors for these respondents; items c, d, f, j, k, n, p, q, and r (see below). These factors, in general, address fit in engineering, teaching, work load and curriculum difficulty, and grades.

Financial reasons (items a and b) do not seem to be influencing students, nor do the services provided by engineering support offices (items v through y), nor student to student interactions (item u).

Table 6. Significance of Factors that Influenced Decision to Leave Engineering

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Not a Factor</th>
<th>A Factor But Not Significant</th>
<th>A Significant Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. No longer receiving a scholarship or other form of financial aid that I needed</td>
<td>111</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>b. Other financial reasons</td>
<td>110</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c. A non-engineering career would be more fulfilling to me</td>
<td>10</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>d. Didn’t feel as if I belonged in engineering</td>
<td>14</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>e. None of my friends are studying engineering</td>
<td>101</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>f. Teaching and classes are better in a non-engineering field that I am now pursuing</td>
<td>45</td>
<td>7</td>
<td>18</td>
</tr>
</tbody>
</table>
g. Studying engineering did not leave me enough free
time or time for a social life  61   21   10    19    8
h. Engineering classes were unfriendly to persons of
my race/ethnicity  109   3    4     2     2
i. Engineering classes were unfriendly to persons of
my gender  89    13   10     4     4
j. I am unhappy with my grades in engineering  32    7   18    22    41
k. Engineering curriculum is too narrow; couldn't bring
together interests outside of engineering  38    10   22    28    22
l. Engineering major didn’t allow me time to work on
community based or volunteer projects  80    15    8    12     5
m. Overall curriculum was too difficult or too lengthy  39    23   20    24    14
n. Excessive work load in engineering curriculum  45    16   15    22    22
o. Engineering classes were too big  79    6    15    13     7
p. Poor teaching by engineering faculty members or
graduate assistants  42    18   19    12    29
q. Foreign language accents of faculty or graduate
assistants made it difficult to understand course
material  46    16   12    22    24
r. Poor teaching by math/science faculty members or
graduate assistants  54    13   20    12    21
s. Group projects in engineering were poorly
conceived and/or implemented  72    18   14     7     9
t. Didn’t get admitted into the engineering major I
wanted  109    2    3    4    2
u. Poor or unpleasant student-to-student interactions
in engineering classes (e.g. not included in groups;
students made unkind remarks or did not include
me)  85    12    5    12     6
v. Engineering advisors gave me poor advice or were
not responsive to my needs  74    14   13    12    11
w. Faculty advisors in my department gave me poor
advice on courses to take or were not responsive to
my needs  85    9    12    6    8
x. Engineering faculty and/or advisor discouraged me
from continuing in engineering  97    8    6    4     5
y. Internship/co-op office was not helpful in finding me
a position  111    5    2    0     2

Selected Results of Analysis by Gender, Ethnicity, Etc.
Respondents were asked to describe their level of involvement in a list of extra curricular activities where 0 = no involvement and 4 = very involved (see Table 3 for frequencies). We examined the responses for differences by gender and ethnicity.

Seventy-three women and 30 men responded to this item. We found a non-significant trend for a gender difference in involvement in activities; F(8, 93) = 2.00, p = .06.

The overall trend towards a significant gender difference can be attributed to significant differences in the two of eight activities that were specifically aimed at women -- professional / student groups for women engineers, and WIE program sponsored activities. Not surprisingly, women reported a significantly higher level of involvement in both of these activities, p = .002 and p = .000 respectively. This same analysis will be repeated when we have a larger more representative male sample; such a sample may show different, and more meaningful results.

GPA did not show a significant relationship with responses on this item: F(8, 93) = 1.04, p = .41 nor was there any significant differences in responses by ethnicity.

Item 15 asked respondents to rate how the extent to which each item in a list of 25 factors contributed to their decision to leave engineering, where 0 indicated that item was not a factor, and 4 indicated the item was a significant factor (see Table 6 for frequencies). We examined the responses for gender differences and also examined whether there was a relationship between self-reported GPA and responses.

We found a statistically significant gender difference, F (26, 44) = 1.85, p = .04. Further analysis of the individual items showed a significant gender difference on two items: “None of my friends are studying engineering”, and “Engineering classes were unfriendly to persons of my gender”. For the first (none of my friends ..) the item was a less significant factor for women (M = .18) than men (M = .68); F (1, 69) = 5.47, p = .02. The item regarding the classroom environment for persons of my gender was more of a factor for women (M = .82) than men (M = 0); F (1, 69) = 8.29, p = .01. One should note, however, the low means for men and women for both of these items. For both items, 0 was by far the most frequently selected response.

We also found that GPA had a significant influence on the respondents’ rating of the reasons for transferring, F (26, 44) = 1.82, p = .04. A further Pearson correlation analysis found that GPA was negatively correlated with the following items – that is the higher the GPA, the less the item was a significant factor:

- I am unhappy with my grades in engineering (item j) (r = -.40, p = .00).
- Overall curriculum was too difficult or too lengthy (item m) (r = -.24, p = .01).
- Foreign language accents of faculty or graduate assistants made it difficult to understand course material (item q) (r = -.20, p = .02).

This type of inverse relationship is intuitively logical. If one’s GPA is higher, then it is less likely that one may see grades, a difficult of a curriculum or foreign accents as being a contributing factor to a decision to switch from engineering. And even if these students agree that the latter

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1 An ethnicity analysis was not possible due to the small number of minority ethnicity respondents.
two items are true (e.g. the foreign language accents are difficult to understand) they did not see
them as contributing to their decision to switch. We recognize that this same logic might imply
that we see the same negative correlation with other items that relate to teaching or learning
impediments (e.g. Poor teaching by engineering faculty members). The fact that these other
correlations were not statistically significant may be attributable to the relatively small sample
size.

GPA was positively correlated with this item—that is the higher the GPA, the greater the
agreement:

- Engineering curriculum is too narrow; couldn't bring together interests outside of
  engineering (item k) \( (r = .25, p = .01) \).

The explanation for this positive correlation is less obvious. It seems to indicate that the more
academically competent students were unhappy with the very focused nature of an engineering
curriculum – and that these students found it important to be able to bring in interests other than
engineering, into their course of study. If this is the case, the authors find this to be a disturbing
result. Successful practicing engineers require not only technical, engineering skills but social,
communication, business and possibly political skill as well (ABET, 2005; Jonassen, in press). Given
these diverse needs for a successful engineer, it would follow that engineering colleges
would wish to embrace and attract students with broader interest sets. We will continue to track
this result as data collection continues and consider it for qualitative methods follow up data
collection.

Conclusions and Future Activities

This paper has described a new quantitative data collection instrument for collecting profile
information (e.g. academic preparation, reasons for choosing engineering, participation in
academic support and extracurricular activities) and measuring the factors that influenced
students’ decision to switch out of an engineering degree program. We also reported the results
of a pilot data collection effort of 120 students from five institutions in the U.S. who left
engineering during the 2003 – 2004 academic year.

The preliminary analysis shows that

- Most were traditional college age students who had started their programs directly after
  high school, and their self-reported GPAs ranged from 1.82 to 4.0.
- A little over half the sample (59%) felt that high school had adequately prepared them to
  succeed in an engineering curriculum.
- The most frequently mentioned reason for initially choosing engineering was “being
good at math/ science” (see Table 2). The prospect of getting a job with good pay was
  also frequently mentioned. The choice of “like the work engineers do” had a
  conspicuously low frequency.
- The overall group was not at all active in extra curricular activities (Table3) but did
  indicate they had attended (at least once in the most recent academic year) typical
  academic support activities (Table 4) (e.g. attended a review session before an exam).
• The factors that were most often reported as being significant in the respondents’
decision to leave engineering focused on fit in engineering, teaching, work load and
curriculum difficulty, and grades (see Table 6).
• Gender differences were found in the frequency of participation in the extracurricular
activities that were specifically oriented towards women as well as two of the factors
reported to be significant in the respondents’ decision to leave engineering -- “None of
my friends are studying engineering”, and “Engineering classes were unfriendly to
persons of my gender”. Once again the second item is gender specific, however the
explanation for the gender difference for the “none of my friends” item is somewhat
puzzling.

As indicated earlier, further gender analysis results will be available at the conference, however
since male students completed the instrument at only one institution these results will not be
representative of all institutions.

We recognize that these results would be much more helpful if comparable data were available
from students who had persisted in engineering study. As part of grant activities we are currently
developing a “persisters” version of this instrument so that institutions may gather comparative
data between those that persist and those who do not. We note the important results from
Seymour and Hewitt (1997) that indicate that there was no difference in the educational
problems reported by persisters and switchers; what seemed to vary between the two groups
were rather the coping strategies they employed to address these problems.

However as noted previously the students who participated in the Seymour and Hewitt (1997)
and other studies addressing engineering retention studies arguably experienced different high
school environments and curricula and social norms and expectations than students – both male
and female – do today. Thus there is both a need for current data collection using a reliable and
valid predominantly quantitative instrument, as well as the potential expectation that we may
find different results. Overall, since the expectations and preparation of women students entering
engineering have changed significantly over the past seven years, it is important to measure what
their current choices and experiences are.

Future activities associated with this project include:
• Develop the “persisters” version of this instrument. Collect data not only at graduation
but also at typical times during the engineering course of study when students switch out
of engineering (e.g. end of sophomore year).
• Collect data from male “switcher” students at all institutions. This work item implies the
need to work with directors of WIE, MEP and other engineering administrators to
develop systematic methods for identifying all students who have transferred out of
engineering. Author Bogue’s experience at PSU indicates that these systems are unlikely
to be in place – but of course are necessary if the engineering community hopes to get
representative results using this instrument.
• Collect more data from minority population students.
• Conduct gender and ethnicity analysis on all items. How do the responses of these
populations vary?
• Recommend and conduct follow-up qualitative data collection to clarify results gathered from the quantitative instrument. As already seen in this initial analysis, there are and will be more results from this instrument that are counter-intuitive, or difficult to explain (e.g. why is there a gender difference on the “none of my friends are studying engineering” item where this is less of a factor for women than men?). We developed a predominantly quantitative instrument not because we don’t value qualitative data but rather because most engineering administrators and WIE and MEP program personnel do not have the time or expertise to gather and analyze qualitative data. However, once one has a body of quantitative data from this instrument, we anticipate the need for qualitative data to answer the “why” questions for the results one sees from certain aspects of the data. We anticipate designing and conducting follow-up focus groups and interviews in targeted areas to address such questions.

References


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