

The View from Here: How the Freshman Experience Looks to Young Women at NC State University

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Abstract

Many things about the transition from high school to college are different when viewed from the perspective of a female student compared to a male. From the interface with faculty and advisors to the diversity in individual classrooms, the same actual experience is perceived and internalized by each student from a perspective informed by his or her own previous experience. This paper will look at data collected from surveys and focus groups of College of Engineering students disaggregated by gender. The goal of collecting and analyzing this type of data is to discover whether certain aspects of the freshman experience can have impact on the success and retention rates of female students in the College of Engineering.

Introduction

Women have comprised about 20% of each entering class in the College of Engineering for the last several years. Traditional recruiting methods are not sufficient to increase that number, and while non-traditional methods are being developed and applied, retention of female students becomes an even more important issue. Data collected over the past several years have also shown that, although females are graduating at a higher rate than their male colleagues, they are leaving the College of Engineering to do it (see figure 1 for an example cohort).

In each cohort women are graduating from the College of Engineering at lower rates. Their cognitive variables, however, tend to exceed that of the male students. In any given semester, the overall average GPA of the women students in a cohort tends to exceed that of the males.

Another way of looking at retention is to examine the number of students in a cohort retained from year to year prior to graduation, see figure 2.

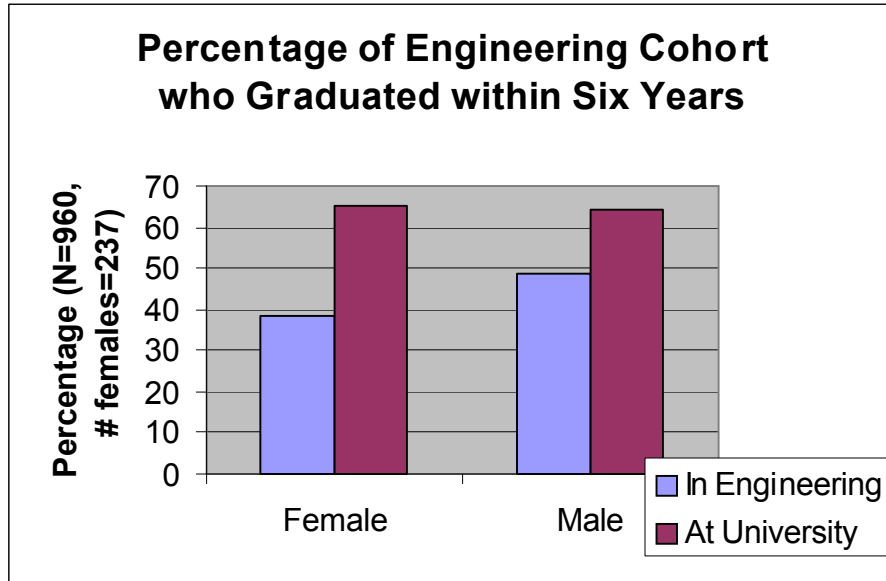


Figure 1: Percentage of students in 1995 Freshman cohort admitted to the College of Engineering who graduated within six years at NC State and in Engineering

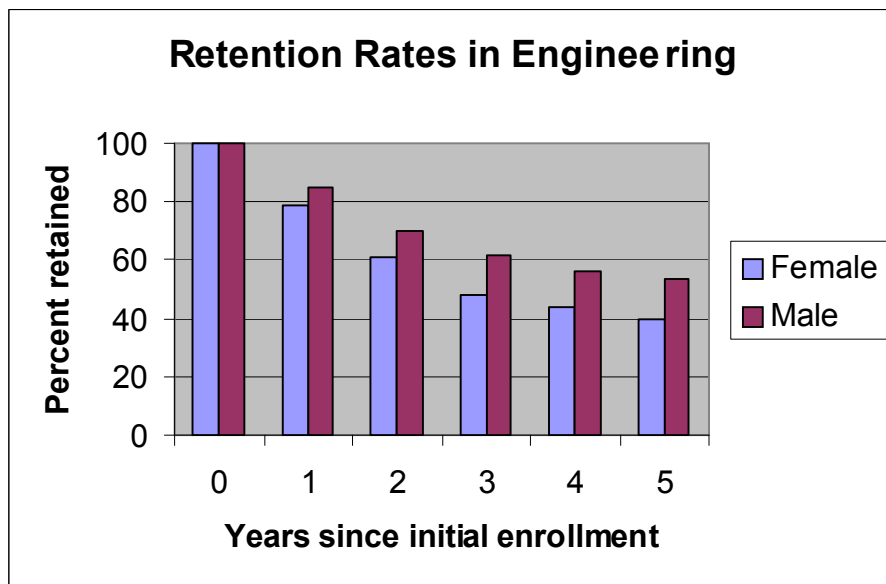


Figure 2: Percentage of 1995 engineering cohort still enrolled in the fall of each year

Figure 2 shows that an "enrollment gap" between male and female engineering students appears to open up after one year, but to widen after two years. Seeking the cause of this gap led to the research outlined in this paper. Two types of data were collected. Two focus groups were held for female first year engineering students about halfway through the semester. In addition, male and female first year engineering students were surveyed during the last week of the semester.

The questions used in each of the data collections were selected on the basis of previous research and experience. Some examples of the research used to formulate the survey questions are given below.

1-It is commonly assumed that women tend to internalize experiences more than men and to blame themselves rather than external factors in cases of failure (see, for example, [1,2,3]).

2-Females tend to have lower rates of self-confidence in mathematical or highly technical areas [4, 5]. In fact, female engineering students at NC State have lost confidence in their abilities in physics during their first semester even though they don't take physics until their second semester [6].

3-Each person tends to internalize experiences in the context of their own past, so maybe female and male engineering students perceive their experiences in the College in different ways that result in more women than men leaving the College before graduation.

4-Analysis of anonymous exit surveys given to each student transferring out of the College show no evidence of overt discrimination. The most commonly cited reason for transferring is the student having discovered that engineering is no longer interesting to them.

5-Anxiety and/or self-doubt DOES affect student achievement. [7]

Focus Group Results

Two groups were held during the Freshman Welcome session held halfway through the fall 2002 semester. Seventeen women attended the first group and twenty-seven women and one man attended the second group. The time available was about forty-five minutes, so only six questions were prepared. "How have the first couple of weeks gone?" was asked as an icebreaker question. Most of the women responded positively, a few noncommittally. Then each person was asked to introduce her(him)self and tell where they went to high school. The next question was "Given your first impressions, what would you say is the atmosphere for women in engineering at NC State?" All of the women responded positively to this question. Some indicated that they thought it was the same for men and women, and the others tended to remain quiet or agree. This result was not unexpected in the light of previous focus groups [8]. The next question also produced responses consistent with previous research, "What made you decide to go into engineering?" Many of the women said they liked math, their parents encouraged them to do so, or they were planning to go to medical school.

The next question, "What programs would you like to see in the College?" led to a diversion from the planned course of the conversation. The women began to talk about programs, but without specific suggestions. They then began to question one another on their experiences in particular classes. One woman suggested that calculus had been challenging due to the use of MAPLE, a computer-based mathematics program. She suggested a program to help the students learn MAPLE. The other students agreed enthusiastically, then began to comment on what they perceived as the incredible dependence on computers at the university. One woman expressed

frustration that, even when she was asking for help or advice from faculty or upper class students, the answer was frequently phrased in the form of a web address. Since the reaction had been so strong in the first group, a question was added to the second group as to whether they perceived increased computer use. All of the students, in both focus groups, agreed that computer usage was significantly increased from that in high school and that they found the use of computers at the university to be off-putting rather than enabling.

Survey Results

A survey was distributed randomly to 100 female and 100 male first year engineering students at Freshman Design Day, the culminating event for the freshman introduction to engineering class. Of these surveys distributed, seventy of the females and seventy-eight of the males returned their surveys. Some of the questions on the survey were designed to address the results of the focus groups, and some were suggested by previous research.

The survey consisted of three parts: a part containing statements with a Lickert scale for response, a short-answer segment, and a part where students were asked to rate their experiences in their various freshman classes. Table 1 lists the statements in the first part.

1=Strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree
I feel like my first semester has been easy.
The College of Engineering has been a welcoming place to start my college career.
I have discovered that engineering is not what I thought it was.
I have used the computer more than I did in high school.
I expect to do well in the College of Engineering.
College has been exactly as I expected it would be.
I know more about what I want to do as a career than I did before this semester.

Table 1: Statements to which students were asked to indicate their degree of agreement

Gender differences were expected in a number of the categories, but students were not asked to record their gender. Rather, different colors of paper (yellow=female and lime green=male) were used to indicate gender. The only identifier the students were asked to provide was the section number of their Introduction to Freshman Engineering class (twenty-three sections were taught in fall 2002). Some sample responses are provided below in figure 3.

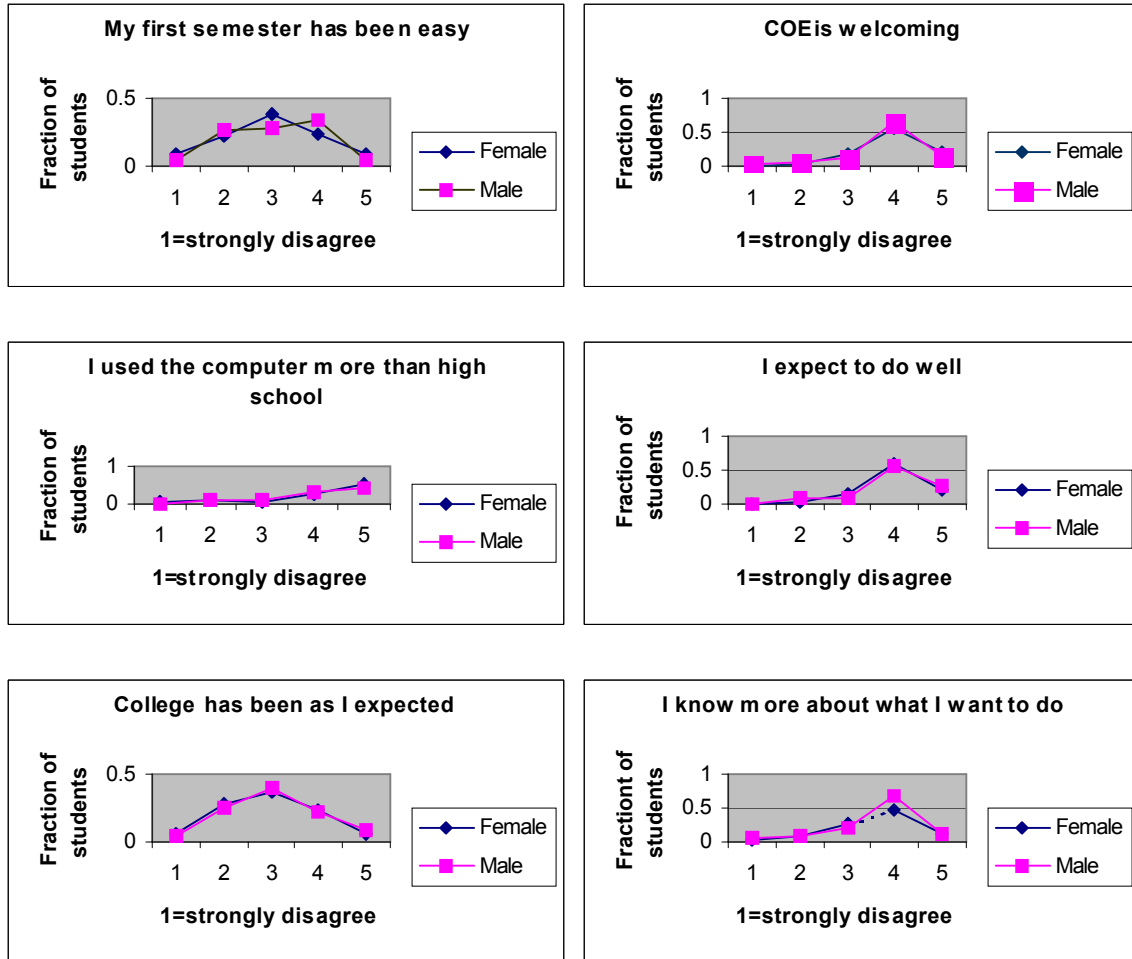


Figure 3: Histograms of responses to survey statements listed in table 1

The mean of each histogram is almost the same for each gender. Both males and females expressed an increase in computer usage. Both expect to do well. The only statement that had a significant difference in response was, "I have discovered that engineering is not what I thought it was." The histogram of responses to that statement is shown in figure 4.

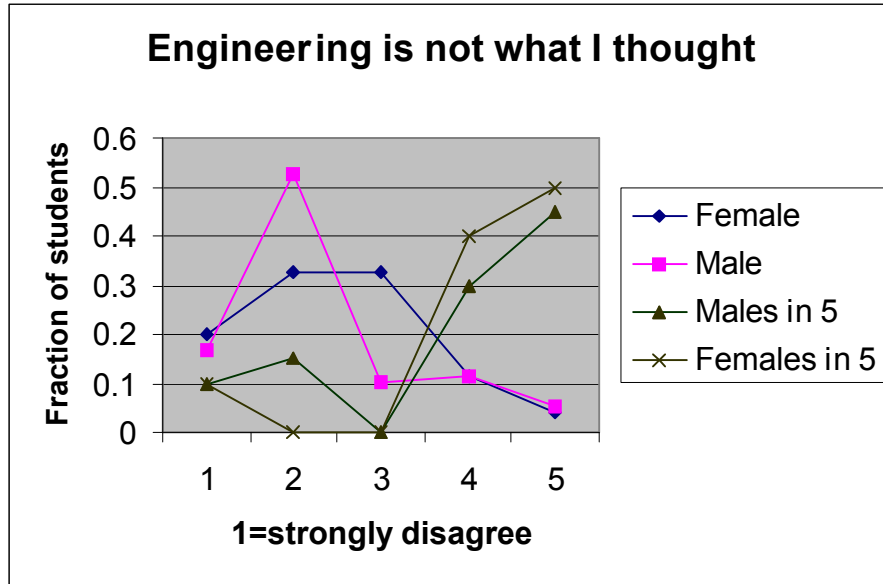


Figure 4: Histogram of survey responses to "I have discovered that engineering is not what I thought it was"

Females tended to be slightly more likely to choose the neutral response to the statement. This statement also provoked the only responses that were significantly correlated with the section of Introduction to Engineering that the student was enrolled in.

Figure 4 also shows the histogram of responses for section 5 of the course, also disaggregated by gender. Note the close agreement between genders in section 5. Perhaps the specific class instructor had more of an impact on preconceived notions by the particular examples and applications that they chose to use in progressing through the standardized syllabus. (The instructor for section 5 was female, but no evidence exists to suggest this had any impact on the results of the survey.)

The second section of the survey consisted of six short answer questions. These questions are listed in table 2.

What has been the overall atmosphere for you at NC State this semester?
What has been the best part of your experience so far?
What has been the worst part of your experience so far?
What has been harder than you expected?
What has been better/easier than you expected?
What could have been done to make your experience better?

Table 2: Short answer survey questions

Responses to the questions tended to fall into few categories. They are summarized below in table 3. Not every student answered every question, and some gave more than one answer. The

answers listed were grouped into categories, which are listed in the table.

Question	Answer	Number of females citing	Number of males citing
1-Overall atmosphere	Positive/friendly/helpful	61	54
	Unfriendly/not enough help	7	3
	Too busy	2	12
	Big adjustment	2	6
2-Best part of experience	Meeting new people/working in groups	36	25
	Dorm life/independence	11	11
	Computers	0	5
	Academics	4	16
3-Worst part of experience	Classes/academics	44	54
	People (TA, Prof, roommate)	9	4
	Lack of study skills/preparation	5	10
4-Harder than expected	Classes/academics	49	48
	Study skills/preparation	11	11
	People (teachers, peers)	4	0
	Nothing/sleeping	0	13
5-Better/easier than expected	Classes/academics	33	32
	People (meeting, working with)	14	7
	Study skills/preparation	2	3
	Adjustment	5	10
6-What could make better	Something I could have done	35	29
	Something you could have done	17	24
	Nothing	9	7

Table 3: Responses to short-answer survey questions disaggregated by gender and grouped by type of response

Some gender differences are notable in the answers to the questions. Males and females both found the overall atmosphere to be positive and cited academics as the worst part of their first semester experience. Academics were also harder and easier than expected for both genders.

Males were more likely to note academics as being the best part of their experience. Females were more likely to list meeting and working with people as part of their first semester that they found better than expected.

For the last question on what could have made their experience better, male students were more likely to list things that the College could have done (i.e. not require introductory classes, make them smaller, get different teachers, etc.). Female students were more likely to suggest that they could have studied more or been better prepared for their classes. Some indication of the tendency of females to blame internal sources for difficulties, versus that of males to blame external sources, can be found in this data.

Conclusions and Future Work

Given the retention gap between female and male students in the College of Engineering, differences in their perceptions of their first semester experience were expected. Survey questions were developed to test this hypothesis, guided by previous research and focus groups with the individuals to be surveyed. The following findings emerged, some of which were counter to the initial hypothesis:

- 1-Male and female students tended to rate their first semester experience almost identically.
- 2-Both groups saw a distinct increase in computer usage at the university.
- 3-Some evidence exists that female students tended to internalize difficulties at a higher rate than their male colleagues.
- 4-Male students tended to blame the university for difficulties at a higher rate than their female colleagues.
- 5-Ratings and responses were more closely correlated with Introduction to Engineering instructor than to gender.

Looking at the retention chart again in figure 2, the greatest growth in the gap between men and women appears to happen between years one and two. The new hypothesis suggested by this study is that something takes place during the second year that discourages female students. As a result of this conclusion, the same cohort of students will be followed through their second year and again surveyed about their experiences. If factors can be identified, it may suggest that efforts at retention might be best focused at second year students, who have just begun coursework specific to their major, rather than just first year students.

References

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