

APPENDIX A

INSTRUMENTS USED IN THE STUDY

- A-1 Fall Questionnaire**
- A-2 Student Consent Form**
- A-3 Spring Questionnaire**
- A-4 Focus Group Interview Schedule**
- A-5 Faculty Interview Schedule**

ENGINEERING STUDENT SURVEY I

Dear Student,

This information is being collected as part of a study of engineering education conducted under the auspices of the Department of Sociology and the National Science Foundation. Your participation in this research will help us to achieve a better understanding of how students are affected by their college engineering education experiences. Detailed information on this research program is available from the principal investigator. Your responses are held in the strictest professional confidence, and your privacy will be maintained in all published and written data resulting from the study. Identifying information has been requested only in order to make subsequent follow-up study possible and will be available only to the principal investigator.

Sincerely,

Harriet Hartman, Principal Investigator
Department of Sociology
Campus extension 3787; hartman@rowan.edu

ENGINEERING STUDENT SURVEY I

Please mark all answers clearly with an X. If you need to change an answer, please erase completely.

- | | |
|--|--|
| <p>1. Year in School: (13)
 ① Freshman ② Sophomore ③ Junior ④ Senior</p> <p>2. Your major: (14)
 ① Chemical engineering
 ② Civil engineering
 ③ Electrical engineering
 ④ Mechanical engineering
 ⑤ General Engineering
 ⑥ Other _____</p> <p>3. Year of Birth: 19_____ (15-16)</p> <p>4. Sex: (17)
 ① Male ② Female</p> <p>5. Marital Status: (18)
 ① Single
 ② Married
 ③ Divorced
 ④ Other _____</p> <p>6a. Do you have any children? (19)
 ① Yes ② No</p> <p>6b. If yes, number of children who are currently living with you:
 _____ (20)</p> <p>7. Please answer the following questions about your living arrangements for this academic year:</p> <p>7a. Are you living: (21)
 ① In your parents' or other relatives home
 ② Other private home, apartment, or room off-campus.
 ③ On campus housing
 ④ Other _____</p> | <p>7b. Which best describes your roommates? (22)
 ① Other students majoring in science, mathematics or engineering
 ② Other students not majoring in science, mathematics or engineering.
 ③ Not students</p> <p>8a. How close is Rowan to your permanent home? (23)
 ① 5 miles or less
 ② 6-10 miles
 ③ 11-50 miles
 ④ 51-100 miles
 ⑤ 101-500 miles
 ⑥ Over 500 miles</p> <p>8b. Is your permanent home (24)
 ① Urban or Suburban
 ② Rural</p> <p>9. Your race/ethnicity: (25)
 ① African American/Black
 ② Asian American/Asian
 ③ Caucasian/ White
 ④ Mexican American/Chicano/Hispanic
 ⑤ Native American/American Indian
 ⑥ Other, specify: _____</p> <p>10. Is your native language English? (26)
 ① Yes
 ② No</p> |
|--|--|

Family Background

11. What was the highest level of formal education obtained by your parents? Mark one in each column.

	<u>11a. Father</u>	<u>11b. Mother</u>
Elementary school or less	①	①
Some high school	②	②
High school graduate	③	③
Post-secondary school other than college	④	④
Some college	⑤	⑤
College degree	⑥	⑥
Some graduate school	⑦	⑦
Master's degree	⑧	⑧
Ph.D./Doctorate	⑨	⑨
Other graduate or professional degree (indicate which)	⑩ _____ (27)	⑩ _____ (28)

12. What is your father's occupation? Please describe in detail

_____ (29-30)

13. What is your mother's occupation? Please describe in detail.

_____ (31-32)

14. Please describe the history of your mother's employment status during the following times. For each period in question, mark the answer that was true for most of the time in question.

	Employed full-time	Employed part-time	Not employed	
14a. Before you were born	①	②	③	(33)
14b. When you were a preschooler	①	②	③	(34)
14c. When you were in elementary school	①	②	③	(35)
14d. When you were in high school	①	②	③	(36)

15. What are your parents' ages?

If one or both of your parents is no longer living or you don't know details about them, please write N/A.

15a. Mother _____ (37)

15b. Father _____ (38)

16a. When you were in elementary school or younger, did you live most of the time: (39)

- ① With both parents
- ② With your mother
- ③ With your father
- ④ Other _____

16b. When you were in middle or junior high or older, did you live most of the time: (40)

- ① With both parents
- ② With your mother
- ③ With your father
- ④ Other _____

17a. How many younger brothers do you have? _____ (41)

17b. How many younger sisters do you have? _____ (42)

17c. How many older brothers do you have? _____ (43)

17d. How many older sisters do you have? _____ (44)

	Yes	No
18a. Have any of your siblings gone to college? (If no, go to #19)	①	② (45)

18b. If yes, do you have a brother who studied or studies Engineering?	①	② (46)
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18c. Do you have a brother who studied or studies another science or math field?	①	② (47)
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18d. Do you have a sister who studied or studies Engineering?	①	② (48)
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18e. Do you have a sister who studied or studies another science or math field?	①	② (49)
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19. For each of the following people, what was their opinion about your pursuit of an engineering major or career? Mark whether their opinion was positive, negative, or neutral.

	Positive	Neutral	Negative	
	①	②	③	
19a. Mother	①	②	③	(50)
19b. Father	①	②	③	(51)
19c. Other relative	①	②	③	(52)
19d. Best friend(s)	①	②	③	(53)
19e. Boyfriend/girlfriend	①	②	③	(54)
19f. Most influential teacher	①	②	③	(55)
19g. High school guidance counselor	①	②	③	(56)
19h. Someone else you knew who works in a science/math/engineering field	①	②	②	(57)

20. To what extent do your parents support your being in engineering? Mark one answer in each column.

	<u>20a. Mother</u>	<u>20b. Father</u>
Strongly supportive	①	①
Moderately supportive	②	②
Neutral	③	③
Moderately oppose	④	④
Strongly oppose	⑤	⑤
	(58)	(59)

High School Background

21. In what year did you graduate from high school? (60-61)

22. Approximately how many students were in your high school senior class? _____ (62-63-64)

23. Which of the following describes your high school?

Mark one answer for each question.

23a. My high school was: (65)

- ① Public
- ② Parochial/religious
- ③ Other private
- ④ I was home schooled

23b. My high school was: (66)

- ① Co-ed
- ② Single-sex

23c. My high school was located in (67)

- ① an urban area
- ② a suburban area
- ③ a rural area.

24a. What was your overall GPA in high school? _____ (68)

24b. In your high school science courses, did you receive (69)

- ① Mostly A's
- ② Mostly A's and B's
- ③ Mostly B's and C's
- ④ Mostly C's or lower

24c. In your high school mathematics courses, did you receive: (70)

- ① Mostly A's
- ② Mostly A's and B's
- ③ Mostly B's and C's
- ④ Mostly C's or lower

25a. What was your verbal SAT score? _____ (71-72-73)

25b. What was your math SAT score? _____ (74-75-76)

26. How many semesters of each of the following subjects did you study during grades 9 to 12 (including summers)?

Count a yearlong course as two semesters and a summer course as one. Include AP courses and courses taken at a local college.

	<u>Number of Semesters</u>	
26a. Biology	_____	(77)
26b. Chemistry	_____	(78)
26c. Earth science/Geology/Anthropology	_____	(79)
26d. Physics	_____	(80)
26e. Environmental science	_____	(81)
26f. Engineering	_____	(82)
26g. Computer science	_____	(83)
26h. Other science (Specify: _____)	_____	(84)
26i. Calculus	_____	(85)
26j. Math/Statistics other than calculus	_____	(86)

27. Did any of your high school science courses have a lab component?

- ① Yes
 - ② No
- (87)

28. Prior to entering college did you take any of the following advanced placement courses?

	Yes	No	
28a. AP Calculus AB	①	②	(88)
28b. AP Chemistry	①	②	(89)
28c. AP Calculus BC	①	②	(90)
28d. AP Biology	①	②	(91)
28e. AP Physics	①	②	(92)
28f. AP Environmental science	①	②	(93)
28g. Other honors or advanced science or math course (Specify: _____)	①	②	(94)

29a. Did you ever have a female teacher for math or science in high school?

- ① Yes ② No (95)

29b. If yes, how many? (96)

- ① 1-2
② 3-4
③ 5 or more

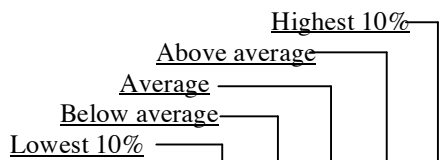
30. Did you participate in any of the following science, math or engineering activities during grades 9 to 12?

	<u>Yes</u>	<u>No</u>	
30a. Summer science, math or engineering programs	①	②	(97)
30b. Science or math competitions or contests	①	②	(98)
30c. After-school clubs	①	②	(99)
30d. Special programs or workshops (on weekends, after-school)	①	②	(100)
30e. Independent science research course	①	②	(101)
30f. A science or math course at a local college	①	②	(102)
30g. Teaching science, math, or engineering	①	②	(103)
30h. Research experience	①	②	(104)
30i. Paid work experience in science, math or engineering	①	②	(105)
30j. Volunteer work experience or internship	①	②	(106)

You As A Student

31. How would you rate yourself on each of the following traits as compared with the average student your age? Mark one answer for each trait.

	①	②	③	④	⑤	
31a. academic ability						(107)
31b. drive to achieve						(108)
31c. mathematical ability						(109)
31d. popularity with the opposite sex						(110)
31e. self-confidence						(111)
31f. interest in science						(112)
31g. communication skills						(113)



32. A number of different factors influence grades. When you consider your grades in science and mathematics in the previous year, how much of your grades were due to each of the factors listed below?

Please rank from 1-5, 1 being the least important, 5 being the most important.

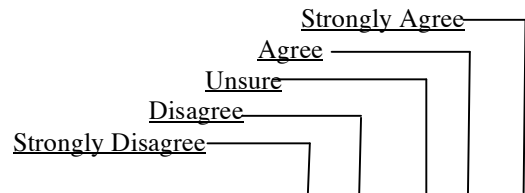
32a. My ability	①	②	③	④	⑤	(114)
32b. How much effort I put in	①	②	③	④	⑤	(115)
32c. Luck	①	②	③	④	⑤	(116)
32d. Ease/difficulty of material	①	②	③	④	⑤	(117)
32e. Quality of teaching	①	②	③	④	⑤	(118)

33. Please indicate the extent to which you agree or disagree with the following statement:

Getting help for my academic work would be an admission of my own lack of ability or ignorance. (119)

- ① Strongly disagree
② Disagree
③ Unsure
④ Agree
⑤ Strongly agree

34. The following items relate to different study habits. Please indicate how strongly you agree or disagree with the following statements.



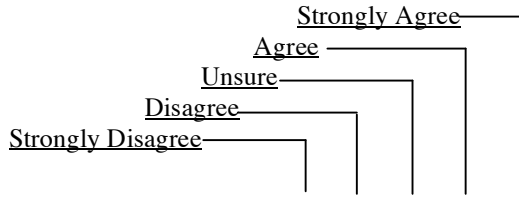
34a. Studying in a group is better than studying by myself	①	②	③	④	⑤	(120)
34b. Creative thinking is one of my strengths	①	②	③	④	⑤	(121)
34c. I need to spend more time studying than I currently do	①	②	③	④	⑤	(122)
34d. I have strong problem solving skills	①	②	③	④	⑤	(123)
34e. I prefer studying alone	①	②	③	④	⑤	(124)
34f. I enjoy group assignments or projects in class	①	②	③	④	⑤	(125)

You and Engineering

35. Was your current major your first choice? (126)

- ① Yes ② No

36. How satisfied are you with your major in engineering?
Please indicate the extent to which you agree with the following statements.



36a. I am personally satisfied with my choice of a college major ① ② ③ ④ ⑤ (127)

36b. I have no desire to change to another major (biology, English, chemistry, art, history, etc.) ① ② ③ ④ ⑤ (128)

36c. I can think of several other majors that would be more rewarding than engineering ① ② ③ ④ ⑤ (129)

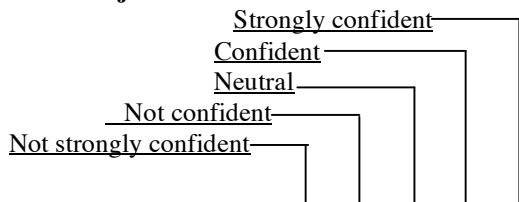
36d. I am confident that engineering is the right major for me ① ② ③ ④ ⑤ (130)

36e. The advantages of studying engineering outweigh the disadvantages ① ② ③ ④ ⑤ (131)

36f. The future benefits of studying engineering are worth the effort ① ② ③ ④ ⑤ (132)

36g. The rewards of getting an engineering degree are not worth the effort ① ② ③ ④ ⑤ (133)

37. Below are some of the subjects and skills needed in engineering. Please indicate how confident you are of your abilities in the subject or skill.



37a. Chemistry ① ② ③ ④ ⑤ (134)

37b. Physics ① ② ③ ④ ⑤ (135)

37c. Calculus ① ② ③ ④ ⑤ (136)

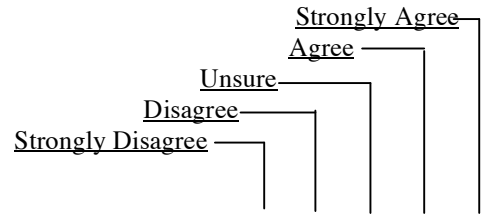
37d. Engineering ① ② ③ ④ ⑤ (137)

37e. Writing ① ② ③ ④ ⑤ (138)

37f. Speaking ① ② ③ ④ ⑤ (139)

37g. Computer skills ① ② ③ ④ ⑤ (140)

38. Students have different assessments of their own engineering strengths To what extent do you agree with the following statements about yourself?



38a. I am well-suited for my choice of college major ① ② ③ ④ ⑤ (141)

38b. I consider myself mechanically inclined ① ② ③ ④ ⑤ (142)

38c. I am confident that I will do well in the math, science, and engineering courses I have this year. ① ② ③ ④ ⑤ (143)

38d. I am competent in skills required for my major ① ② ③ ④ ⑤ (144)

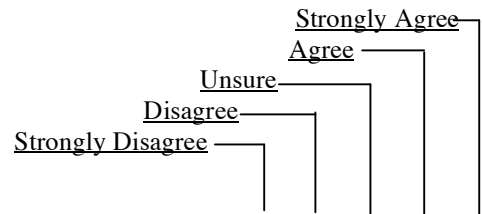
38e. I am good at designing things ① ② ③ ④ ⑤ (145)

38f. I consider myself technically inclined. ① ② ③ ④ ⑤ (146)

38g. I am well-suited for my chosen career ① ② ③ ④ ⑤ (147)

38h. I am confident that I will be able to handle my course work this year ① ② ③ ④ ⑤ (148)

39. People enjoy different things about engineering. To what extent do you agree with the following statements about your self?



39a. I enjoy solving open-ended problems ① ② ③ ④ ⑤ (149)

39b. I enjoy problems that can be solved in different ways. ① ② ③ ④ ⑤ (150)

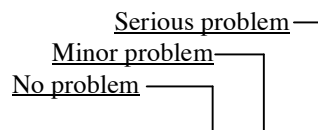
39c. I have a high level of interest in engineering. ① ② ③ ④ ⑤ (151)

39d. I enjoy the subjects of science and mathematics the most. ① ② ③ ④ ⑤ (152)

39e. I enjoy taking liberal arts courses more than math and science courses. ① ② ③ ④ ⑤ (153)

39f. I am overwhelmed by the workload in my engineering courses. ① ② ③ ④ ⑤ (154)

40. The statements listed below have been suggested as difficulties that especially women face in the pursuit of careers in science, mathematics, or engineering. Based on your observations and experiences, please indicate your opinions about these claims. Do you think these constitute no problem, minor problems, or serious problems for women?



- 40a. Long years of formal preparation needed ① ② ③ (155)
- 40b. Possible conflicts between career and family responsibilities ① ② ③ (156)
- 40c. View that women majoring in science or technical fields are unfeminine ① ② ③ (157)
- 40d. Lack of encouragement from teachers or counselors ① ② ③ (158)
- 40e. Lack of encouragement from family or friends ① ② ③ (159)
- 40f. Women's lack of confidence that they can handle the work ① ② ③ (160)
- 40g. Lack of information about careers in scientific field ① ② ③ (161)
- 40h. Lack of female role models in scientific fields ① ② ③ (162)
- 40i. Women cannot be as competitive as science classes require ① ② ③ (163)
- 40j. Discriminatory attitudes toward women on part of teachers or others in scientific fields generally ① ② ③ (164)
- 40k. Discriminatory attitudes toward women on part of teachers or others in scientific fields at Rowan ① ② ③ (165)

Future Expectations

41. What is the highest degree you expect to complete? (166)

- ① B.A./B.S
- ② M.A./M.S.
- ③ Ph.D.
- ④ Other (please specify)_____

42. How likely is it that you would consider dropping out of the engineering program before earning a degree? (167)

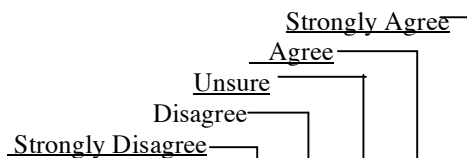
- ① Very unlikely
- ② Not likely
- ③ Not sure
- ④ Possible
- ⑤ Very likely

43. Do you have any concern about your ability to finance your college education? (168)

- ① I am confident that I will have sufficient funds
- ② I will probably have enough funds
- ③ I am not sure I will have enough funds to complete college
- ④ I am seriously concerned about having enough funds to complete college

44. People have different expectations of what a degree in Engineering will lead to. Please indicate the degree to which you agree or disagree with each of the following statements.

A degree in Science/Mathematics/Engineering will allow me to:



- 44a. get a well-paying job ① ② ③ ④ ⑤ (169)
- 44b. choose to live in any geographic location I want ① ② ③ ④ ⑤ (170)
- 44c. get a job I like doing ① ② ③ ④ ⑤ (171)
- 44d. be respected by others ① ② ③ ④ ⑤ (172)
- 44e. get a job where I can use my talents ① ② ③ ④ ⑤ (173)
- 44f. get a secure job throughout my adult life ① ② ③ ④ ⑤ (174)
- 44g. get a challenging job ① ② ③ ④ ⑤ (175)
- 44h. have time to devote to interests outside my job ① ② ③ ④ ⑤ (176)
- 44i. get a job where I will associate with interesting people ① ② ③ ④ ⑤ (177)
- 44j. be an important contributor to society ① ② ③ ④ ⑤ (178)

ENGINEERING STUDENT SURVEY II

Dear Student,

This questionnaire is designed to understand more about your experiences this year in the engineering program at Rowan and how you see yourself and your future in engineering at this point in time. This information is being collected as part of a study of engineering education sponsored by the National Science Foundation, in cooperation with the Department of Sociology and the Center for Student Life and Development at Rowan. Your participation in this research is voluntary, and your cooperation is greatly appreciated. Your responses are held in the strictest professional confidence, and your privacy will be maintained in all published and written data resulting from the study. Identifying information, which will be available only to the principal investigator, has been requested only in order to link up to your answers on the first questionnaire earlier this year and to make subsequent follow-up study possible. Additional information on this research project is available from the principal investigator.

Sincerely,

Harriet Hartman, Principal Investigator
Department of Sociology
Campus extension 3787; hartman@rowan.edu

Name _____

Social Security # - - - - -



ENGINEERING STUDENT SURVEY II

Please mark all answers clearly with an X. If you need to change an answer, please erase completely.

Academic Activities

1. Year in School:

① Freshman Sophomore ③ Junior ④ Senior

2. Your current major:

- ① Chemical engineering
- Civil engineering
- ③ Electrical engineering
- ④ Mechanical engineering
- ⑤ General engineering
- ⑥ Other _____

3. Have you changed your major during the past year?

- ① No, I didn't change my major.
- Yes, I switched major:
 - From chemical engineering
 - ③ From civil engineering
 - ④ From electrical engineering
 - ⑤ From mechanical engineering
 - ⑥ From general engineering
 - ⑦ From another field. Which? _____

4a. The total number of engineering credits you have completed in engineering (including this semester):

b. The total number of general education credits you have completed (including this semester):

5. Do you think your high school education prepared you adequately for your experience in engineering?

(Please indicate how strongly you agree or disagree with the following statements.)

- a. Overall, the education I received in high school prepared me well for my academic course work here
- b. My high school chemistry prepared me well for chemistry course work here
- c. My high school mathematics prepared me well for mathematics course work here
- d. My high school physics prepared me well for physics course work here
- e. My high school prepared me well for computer science here
- f. My high school prepared me well for the writing that is required here

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
a. Overall, the education I received in high school prepared me well for my academic course work here	①	②	③	④	⑤
b. My high school chemistry prepared me well for chemistry course work here	①	②	③	④	⑤
c. My high school mathematics prepared me well for mathematics course work here	①	②	③	④	⑤
d. My high school physics prepared me well for physics course work here	①	②	③	④	⑤
e. My high school prepared me well for computer science here	①	②	③	④	⑤
f. My high school prepared me well for the writing that is required here	①	②	③	④	⑤

6. Did you ever attend another college before coming to Rowan?

- ① Yes, a two-year college.
- ② Yes, a four-year college or university.
- ③ No, Rowan is the first college or university I've attended.

7. During this academic year, how frequently have you participated in any of the following activities?

	Once a week or more	1-3 times a month	1-3 times a semester or less	Never
a. Participated in a study group	①	②	③	④
b. Received tutoring	①	②	③	④
c. Been a tutor	①	②	③	④
d. Met with an academic advisor	①	②	③	④
e. Received career counseling	①	②	③	④
f. Received peer mentoring	①	②	③	④
g. Read an engineering newsletter or listserv	①	②	③	④
h. Heard an engineering speaker (outside of class)	①	②	③	④
i. Went on a field trip to industry site	①	②	③	④

8. How active are you in the following student professional societies*?

	AIChE	ASCE	IEEE	ASME	SWE
a. Participation					
1. Go to most meetings	①	①	①	①	①
2. Go occasionally	②	②	②	②	②
3. Rarely go	③	③	③	③	③
4. Never go	④	④	④	④	④
b. Membership					
1. Yes	①	①	①	①	①
2. No	②	②	②	②	②
c. Officer					
1. Yes	①	①	①	①	①
2. No	②	②	②	②	②

*AIChE=American Institute of Chemical Engineers
ASCE=American Society of Civil Engineers
IEEE=Institute of Electrical & Electronic Engineers
ASME=American Society of Mechanical Engineers
SWE=Society of Women Engineers

9. Have you had an engineering internship in the past year?

- ① No
- ② Yes, in the summer only
- ③ Yes, during the academic year only
- ④ Yes, both in the summer and during the academic year

10. During this academic year, have you:

	Yes	No
a. worked, for pay, for a faculty member	①	②
b. conducted research with a faculty member	①	②
c. had a faculty member give you a job reference or help you find a job	①	②

11. During this academic year, how many women engineering faculty have been the primary instructors of the courses you have taken?

- 0 ① ② ③+

12. The following items relate to different study habits. (Please indicate how strongly you agree or disagree with the following statements.)

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
a. Studying in a group is better than studying by myself	①	<input type="checkbox"/>	③	④	⑤
b. I need to spend more time studying than I currently do	①	<input type="checkbox"/>	③	④	⑤
c. I have strong problem solving skills	①	<input type="checkbox"/>	③	④	⑤
d. Creative thinking is one of my strengths	①	<input type="checkbox"/>	③	④	⑤
e. I prefer studying alone	①	<input type="checkbox"/>	③	④	⑤
f. I do not enjoy working in assigned groups in class	①	<input type="checkbox"/>	③	④	⑤
g. Working in assigned teams with classmates helps me understand material presented in class	①	<input type="checkbox"/>	③	④	⑤
h. The clinic experience of working with students in other majors gives good teamwork experience	①	<input type="checkbox"/>	③	④	⑤
i. Teamwork slows down the learning process in the clinic setting	①	<input type="checkbox"/>	③	④	⑤
j. I don't like group work because usually not everyone does their fair share	①	<input type="checkbox"/>	③	④	⑤

13. Has your experience in the engineering clinics made you more or less positive about working in groups/teams?

- ① More positive
- ② Hasn't changed my opinion about groups/teams
- ③ More negative

14. As of last semester,

a. what is your overall GPA? _____

b. what is your average GPA in your engineering courses? _____

Non-Academic Activities

15. During this academic year, how frequently have you participated in any of the following activities?

	Once a week or more	1-3 times a month	1-3 times a semester or less	Never
a. Participated in one or more (non-engineering specific) student organizations	①	②	③	④
b. Participated in an intramural or varsity sport	①	②	③	④
c. Socialized with non-engineering students	①	②	③	④

16. Are you a member of a fraternity or a sorority?

- ① Yes
- ② No

17. During this academic year, have you held any paid job?

- ① No (skip to question 22)
- ② Yes, one job
- ③ Yes, more than one job

18. How many weeks during the academic year (excluding the summer) did you work in a paid job?

19. During those weeks that you worked (excluding the summer), what was the average number of hours per week you worked?

20. Where was your primary place of employment?

- ① On-campus
- ② Off-campus

21. Were any of your jobs related to your academic or career interest?

- ① Yes, in engineering
- ② Yes, but not in engineering
- ③ No

Interpersonal Interaction

22. During this academic year, how often have you talked with faculty about:

	Once a week or more	1-3 times a month	1-3 times a semester or less	Never
a. course material, assignments, tests, etc.	①	②	③	④
b. your career	①	②	③	④
c. what courses to take	①	②	③	④
d. other personal concerns	①	②	③	④

23. During this academic year, how often have you visited faculty in their offices or outside the classroom (e.g., during office hours or by appointment)?

- ① Never
- ② Once or twice
- ③ Occasionally
- ④ Often

24. During this academic year, have there been any particular faculty who encouraged you or were personally supportive of you?

- ① No
- ② Yes, female faculty
- ③ Yes, male faculty
- ④ Yes, both female and male faculty

25. From your experience, engineering faculty at Rowan usually: (Please indicate how true the following are for your experience. 1= not at all true, 2=somewhat untrue, 3=sometimes true and sometimes untrue, 4=somewhat true, 5=very true)

a. are approachable	① ② ③ ④ ⑤
b. expect too much of students	① ② ③ ④ ⑤
c. are available to students outside of classroom hours	① ② ③ ④ ⑤
d. are friendly	① ② ③ ④ ⑤
e. expect everyone to act the same	① ② ③ ④ ⑤
f. listen to me when I am troubled about something	① ② ③ ④ ⑤
g. give me helpful feedback on papers, projects, and ideas	① ② ③ ④ ⑤
h. support and encourage me	① ② ③ ④ ⑤
i. show that they respect me	① ② ③ ④ ⑤
j. show they care about me as an individual	① ② ③ ④ ⑤
k. care whether I learn the course material	① ② ③ ④ ⑤

26. From your experience, engineering students at Rowan usually: (Please indicate how true the following are for your experience. 1= not at all true, 2=somewhat untrue, 3=sometimes true and sometimes untrue, 4=somewhat true, 5=very true)

- a. are approachable ① ② ③ ④ ⑤
- b. are very competitive ① ② ③ ④ ⑤
- c. support and encourage each other ① ② ③ ④ ⑤
- d. are friendly ① ② ③ ④ ⑤
- e. help each other out on coursework, projects and ideas ① ② ③ ④ ⑤
- f. work harder than non-engineering students at Rowan ① ② ③ ④ ⑤
- g. are proud to be engineering students ① ② ③ ④ ⑤
- h. feel a sense of community in the Engineering College ① ② ③ ④ ⑤
- i. are highly regarded by non-engineers at Rowan ① ② ③ ④ ⑤
- j. mix in well with non-engineering students at Rowan ① ② ③ ④ ⑤
- k. listen to me when I am troubled about something ① ② ③ ④ ⑤
- l. show that they respect me ① ② ③ ④ ⑤
- m. show they care about me as an individual ① ② ③ ④ ⑤

Satisfaction with Engineering

27. How satisfied are you with your major in engineering? (Please indicate the extent to which you agree with the following statements.)

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
a. I am personally satisfied with my choice of a college major	①	□	③	④	⑤
b. I have no desire to change to another major (biology, English, chemistry, art, history, etc.	①	□	③	④	⑤
c. I can think of several other majors that would be more rewarding than engineering	①	□	③	④	⑤
d. I am confident that engineering is the right major for me	①	□	③	④	⑤
e. The advantages of studying engineering outweigh the disadvantages	①	□	③	④	⑤
f. The future benefits of studying engineering are worth the effort	①	□	③	④	⑤
g. If I could start over, I would again choose to go to Rowan for my engineering degree	①	□	③	④	⑤

28. People enjoy or dislike different things about engineering. (Please indicate the extent to which you agree with the following statements.)

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
a. I enjoy solving open-ended problems	①	□	③	④	⑤
b. I enjoy problems that can be solved in different ways.	①	□	③	④	⑤
c. I enjoy the subjects of science and mathematics the most.	①	□	③	④	⑤
d. I enjoy laboratory work	①	□	③	④	⑤
e. I enjoy working with computers.	①	□	③	④	⑤
f. I like to reason mathematically.	①	□	③	④	⑤
g. I like to trouble-shoot problems.	①	□	③	④	⑤
h. I have a lot in common with other students in my department.	①	□	③	④	⑤
i. I enjoy making presentations about my work.	①	□	③	④	⑤

29. How satisfied are you with the following aspects of the Rowan engineering program? (Please indicate the extent to which you agree or disagree with the following statements)

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
a. Departmental advisors do a good job	①	□	③	④	⑤
b. I can usually get the classes I need in the semester that I need them	①	□	③	④	⑤
c. More lab experience would be worthwhile	①	□	③	④	⑤
d. Expectations for lab work are explained well	①	□	③	④	⑤
e. Lab work adds a lot to my understanding of course material	①	□	③	④	⑤
f. Many of my classes are too large	①	□	③	④	⑤
g. There are ample opportunities for students to do independent research at Rowan	①	□	③	④	⑤
h. The grading system reflects students' knowledge and competency in the subject matter	①	□	③	④	⑤
i. There are ample opportunities offered for student internships in engineering	①	□	③	④	⑤
j. Engineering courses are intellectually challenging	①	□	③	④	⑤
k. The workload for engineering students is too heavy and difficult	①	□	③	④	⑤
l. The pace of learning in many of the required courses is too fast	①	□	③	④	⑤
m. Too much group work is required in the engineering classes	①	□	③	④	⑤
n. Not enough attention is given to different styles of learning in engineering classes	①	□	③	④	⑤
o. Engineering professors expect students to have better developed computer skills than they actually have	①	□	③	④	⑤

30. Many things are said about the engineering clinics.

(Please indicate the extent to which you agree or disagree with the following statements about the clinic program.)

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
a. The clinic system provides realistic experiences like in the work world	①	<input type="checkbox"/>	③	④	⑤
b. The clinic projects provide useful hands-on experience in engineering	①	<input type="checkbox"/>	③	④	⑤
c. The interdisciplinary nature of the clinic system enables me to connect things from different discipline which I wouldn't have done without it	①	<input type="checkbox"/>	③	④	⑤
d. Too much work is expected in the clinic courses for the amount of credit that is given	①	<input type="checkbox"/>	③	④	⑤
e. The clinic setting serves to unify engineering students in the same class but from different majors	①	<input type="checkbox"/>	③	④	⑤
f. The interdisciplinary nature of the engineering clinics means that a lot of time is spent learning material or approaches irrelevant to my major	①	<input type="checkbox"/>	③	④	⑤

31. What was your best course this year?

32. Which course did you least like this year?

Engineering Strengths

33. Students differ in terms of how well-suited they think they are to be an engineer. To what extent do you agree with the following statements about yourself?

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
a. I am well-suited for my choice of college major	①	<input type="checkbox"/>	③	④	⑤
b. I consider myself mechanically inclined	①	<input type="checkbox"/>	③	④	⑤
c. I am good at designing things	①	<input type="checkbox"/>	③	④	⑤
d. I consider myself technically inclined.	①	<input type="checkbox"/>	③	④	⑤
e. I am am well-suited for my chosen career	①	<input type="checkbox"/>	③	④	⑤

34. How would you rate yourself on each of the following traits as compared with the average engineering student in your class?

	Lowest 10%	Below average	Average	Above average	Highest 10%
a. drive to achieve	①	<input type="checkbox"/>	③	④	⑤
b. mathematical ability	①	<input type="checkbox"/>	③	④	⑤
c. interest in science	①	<input type="checkbox"/>	③	④	⑤
d. speaking skills	①	<input type="checkbox"/>	③	④	⑤
e. writing skills	①	<input type="checkbox"/>	③	④	⑤
f. test-taking	①	<input type="checkbox"/>	③	④	⑤
g. problem-solving skills	①	<input type="checkbox"/>	③	④	⑤
h. computer skills	①	<input type="checkbox"/>	③	④	⑤
i. library skills	①	<input type="checkbox"/>	③	④	⑤
j. study skills	①	<input type="checkbox"/>	③	④	⑤
k. critical thinking	①	<input type="checkbox"/>	③	④	⑤
l. overall academic ability	①	<input type="checkbox"/>	③	④	⑤

35. Have your abilities in any of the following increased or decreased during this academic year?

	Increased	Stayed the same	Decreased
a. Mathematical ability	①	<input type="checkbox"/>	③
b. Interest in science	①	<input type="checkbox"/>	③
c. Speaking	①	<input type="checkbox"/>	③
d. Writing	①	<input type="checkbox"/>	③
e. Speaking	①	<input type="checkbox"/>	③
f. Test taking	①	<input type="checkbox"/>	③
g. Problem-solving skills	①	<input type="checkbox"/>	③
h. Computer skills	①	<input type="checkbox"/>	③
i. Library skills	①	<input type="checkbox"/>	③
j. Study skills	①	<input type="checkbox"/>	③
k. Critical thinking	①	<input type="checkbox"/>	③
l. Overall academic ability	①	<input type="checkbox"/>	③

36. A number of different factors influence grades. When you consider your grades in engineering this academic year, how important were each of the factors listed below as contributions to your grades?

	Least important	Not so important	In the middle	Somewhat Important	Most important
a. My ability	①	<input type="checkbox"/>	③	④	⑤
b. How much effort I put in	①	<input type="checkbox"/>	③	④	⑤
c. Luck	①	<input type="checkbox"/>	③	④	⑤
d. Ease/difficulty of material	①	<input type="checkbox"/>	③	④	⑤
e. Quality of teaching	①	<input type="checkbox"/>	③	④	⑤
f. Amount of preparation	①	<input type="checkbox"/>	③	④	⑤

37. The statements listed below have been suggested as difficulties that especially women face in the pursuit of careers in science, mathematics, or engineering. Based on your observations and experiences, please indicate your opinions about these claims. Do you think these constitute no problem, minor problems, or serious problems for women?

	No problem	Minor problem	Serious problem
a. Long years of formal preparation needed	①	②	③
b. Possible conflicts between career and family responsibilities	①	②	③
c. View that women majoring in science or technical fields are unfeminine	①	②	③
d. Less encouragement from teachers or counselors than male engineering students get	①	②	③
e. Less encouragement from family or friends than male engineering students get	①	②	③
f. Women's lack of confidence that they can handle the work	①	②	③
g. Lack of information about careers in scientific field	①	②	③
h. Lack of female role models in scientific fields	①	②	③
i. Women are not as competitive as science classes require	①	②	③
j. Discriminatory attitudes toward women on part of teachers or others in scientific fields generally	①	②	③
k. Discriminatory attitudes toward women on part of teachers or others in scientific fields at Rowan	①	②	③

Future Expectations

38. How likely do you think you are to change majors before you graduate?

- ① Very unlikely
- Not likely
- ③ Not sure
- ④ Possible
- ⑤ Very likely

39. What is the highest degree you expect to complete?

- ① B.A./B.S.
- M.A./M.S.
- ③ Ph.D.
- ④ Other (please specify) _____

40. How likely is it that you might transfer to an engineering program in another institution before completing your degree?

- ① Very unlikely
- Not likely
- ③ Not sure
- ④ Possible
- ⑤ Very likely

41. How likely is it that you might drop out of the engineering program before earning a degree?

- ① Very unlikely
- Not likely
- ③ Not sure
- ④ Possible
- ⑤ Very likely

42. Do you have any concern about your ability to finance your college education?

- ① I am confident that I will have sufficient funds
- I will probably have enough funds
- ③ I am not sure I will have enough funds to complete college
- ④ I am seriously concerned about having enough funds to complete college

43. How likely is it that you will be working in an engineering-related field 10 years from now?

- ① Very unlikely
- Not likely
- ③ Not sure
- ④ Possible
- ⑤ Very likely

44. People have different expectations of what a degree in Engineering will lead to. (Please indicate the degree to which you agree or disagree with each of the following statements.)

A degree in Science/Mathematics/Engineering will allow me to:

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
a. get a well-paying job	①	<input type="checkbox"/>	③	④	⑤
b. choose to live in any geographic location I want	①	<input type="checkbox"/>	③	④	⑤
c. get a job I like doing	①	<input type="checkbox"/>	③	④	⑤
d. be respected by others	①	<input type="checkbox"/>	③	④	⑤
e. get a job where I can use my talents	①	<input type="checkbox"/>	③	④	⑤
f. get a secure job throughout my adult life	①	<input type="checkbox"/>	③	④	⑤
g. get a challenging job	①	<input type="checkbox"/>	③	④	⑤
h. have time to devote to interests outside my job	①	<input type="checkbox"/>	③	④	⑤
i. get a job where I will associate with interesting people	①	<input type="checkbox"/>	③	④	⑤
j. be an important contributor to society	①	<input type="checkbox"/>	③	④	⑤

FOCUS GROUP INTERVIEW QUESTIONS

I. Opening questions

*Tell [us] your name and how long you have been at Rowan.
When did you first become interested in engineering?
When did you decide to become an engineering major?
How did you learn of Rowan's engineering program?*

II. Transition Questions

*What made you decide to go into engineering? (or into your [specific major])?
Do you think girls decide to go into engineering for the same reason that boys do?*

III. Key Questions (2-5)

How do you think being female has affected your experience as an engineering student? [List 3 ways you think your experience as an engineering student has been affected by being female.]

Reflecting on your experiences during the past academic year, to what extent were you at an advantage or disadvantage compared to male students in engineering? (especially with respect to: interacting with faculty, receiving attention of the type you wanted, relating to advisor, getting good grades, getting support from engineering faculty, classes, campus, dorms)

In the survey you filled out earlier in the year, more females than males indicated that gender discrimination was a problem for women at Rowan. What types of gender discrimination have you encountered or observed? [Have you heard any stories about ways in which men and women are treated differently at Rowan? Elsewhere?]

How do you think your career as an engineer will be affected by your gender? (Do you think it is easier for women to go into some fields of engineering than other fields? Do you think being a women improves or hinders your prospects of finding a job in engineering? A high paying job?)

IV. Ending questions

*All things considered,
Would you encourage other women to major in engineering?*

Suppose you could make one recommendation to the faculty and staff in the Engineering College, to improve the experience of female engineering students at Rowan. What would be your recommendation? [Magic wand to make dream come true. Pass around. What would dream be?]

Of all the issues we have discussed today, which one stands out as most [important, difficult] for women in engineering at Rowan? in engineering in general?

[Summarize] Have we missed anything? Is there anything that we should have talked about; but didn't

Would you like to have another meeting like this [next semester] [before the end of the semester]?

FACULTY INTERVIEW QUESTIONS

1. Your background, how long at Rowan
2. What do you see as the major strengths, unique features of the program
3. Changes in the program over time (as key to cohort differences)
4. [Key courses to look at grades in]
5. Any sense of gender differences
 - a. In qualifications
 - b. In performance
 - c. Any particularly good female students? Dropouts?
 - d. In self-confidence, self-image
 - e. In ambition, commitment
 - f. In interaction
 - i. In class
 - ii. With faculty
 - iii. With peers
 - g. In attitudes toward, respect of
 - h. Activities outside of class
 - i. In engineering (e.g., professional societies)
 - ii. Outside of engineering
 - i. Any events in last few years indicative of gender discrimination?
 - j. Do they come to you as female faculty for advice?
 - k. Any special problems that female students face?
 - i. Competitiveness?
 - ii. Viewed as unfeminine?
 - iii. Lack of support?

- iv. Lack of role models? (as teachers, in industry)
- v. Lack of appropriate career info?
- vi. Combining family & career
- vii. “Locker room” talk
- viii. Discrimination in workplace, at Rowan
- ix. “Old boy (white male) network”

6. Is Rowan doing all it should for female students?

- a. Is SWE a good thing?
- b. What about the special machining class that Eric Constans ran last year?
- c. Will female graduates be equipped to deal with “old boy (white male) network” in employment or other graduate programs?

7. Any gender issues among the faculty, do female faculty band together in any way?

8. Where do you see the program going in the future?

APPENDIX B

ENGINEERING SELF-CONFIDENCE FACTORS

The indices of engineering self-confidence were derived from a factor analysis of about 20 survey items related to self-confidence that the students were asked in the Fall survey. Items with low commonality were excluded. The remaining items and their loading on the four resulting factors are presented in Table Appendix B-1.

**TABLE APPENDIX B-1
LOADINGS OF SURVEY ITEMS ON SELF-CONFIDENCE FACTORS AND
% VARIANCE EXPLAINED BY EACH FACTOR**

Survey Item	SELF-CONFIDENCE FACTOR			
	CONF STAY ENG	CONF ENG ABIL	CONF COMM SKILL	CONF ACAD ABIL
Engin right major for me	.839	.188		
Consider dropping out	.813			
Well suited for college major	.763	.271		.238
Well-suited for chosen career	.694	.452	.102	.143
Mechanically inclined		.836		
Technically inclined	.233	.827	.128	
Good at designing	.208	.786	.197	
Confidence in speaking skills			.869	
Highest 10% in communication skills			.787	.150
Confidence in writing skills		.116	.718	
Highest 10% in academic ability			.124	.865
Highest 10% in mathematical ability	.106		-.123	.848
Highest 10% in science interest	.263	.106	.164	.471
% variance explained	20.1	18.1	15.5	14.0

Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization

Statistical analysis showed that the factor structure of females and males is similar enough to compare scores of the different genders.