

Assessment Report

Paper Science Department

Spring, 1997

### **Behavioral Objectives for Paper Science Graduates**

Graduates of the Paper Science program at the University of Wisconsin - Stevens Point have the greatest potential for success in their professional lives if they possess the following attributes:

1. Fundamental knowledge of pulp and paper raw materials and processes
2. Excellent communication skills
3. A high level of computer literacy
4. The ability to work effectively as part of a team
5. A professional comportment
6. The ability to continue learning

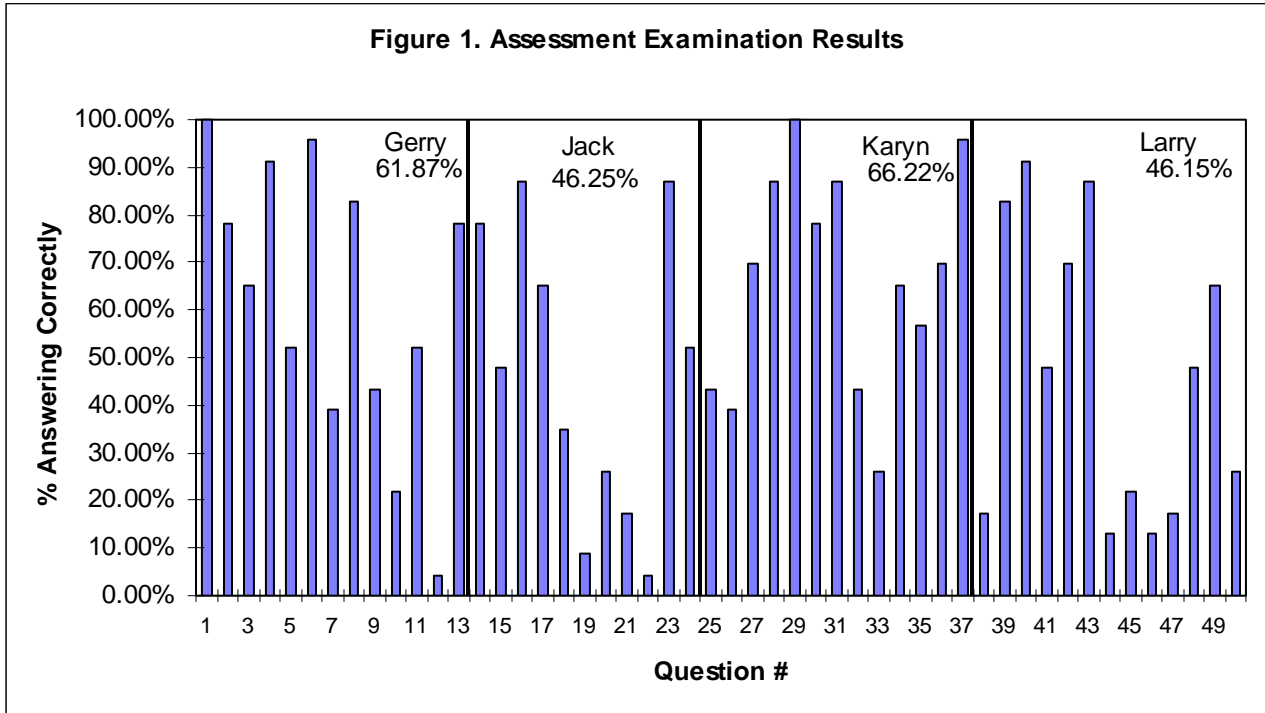
The faculty and academic staff in the Department discussed possible measurements of these objectives. We decided that we should focus on the first three objectives in our initial assessment activity for this semester, since we see these as very important, and more straightforward to measure. The assessments conducted during Spring 1997 are listed below, numbered by objective.

1. The faculty prepared a comprehensive examination for Paper Science seniors. Each faculty member prepared twenty-five questions for the exam. The exam administered to the students consisted of fifty questions selected from all those prepared.
2. The feedback from industry members on student presentations at the Academic Advisory Committee meeting, held on May 8, 1997 is summarized in this report.
3. An examination designed to evaluate computer use skills was administered to the seniors as part of Paper Science 430. The seniors performed an analysis of a mass transfer problem using a spreadsheet, producing graphical and tabular output. The graphs and tables were transferred into the word processing application to produce a short report on the problem solution.

### **Results**

1. The comprehensive examination had fifty questions, covering all major subject areas in the Paper Science curriculum. The actual exam questions appear in Appendix I. Gerry Ring wrote questions 1-13, covering paper and fiber physics, wet end chemistry, and paper manufacture. Jack Maxham

wrote questions 14-24, covering the engineering topics of fluid mechanics, thermodynamics, heat and mass transfer. Karyn Biasca wrote questions 25-37, concerning wood and pulping technology, and basic material and energy balance calculations. Larry Graham contributed questions 38-50, covering process control, fluid mechanics, and paper manufacture. The average score on this exam was 28, with a range from 15 to 35. Figure 1 shows the question by question breakdown of the students' responses. This group of students appears to have a better grasp of the "technology" questions (Gerry's and



Karyn's) than the engineering questions. It would be premature to make final judgements or recommendations based on only one test. We will administer the same exam to the senior class this spring, and decide whether some of the questions are too difficult after evaluating those results.

2. Industry attendees at the student presentations during the May meeting of the Paper Science Academic Advisory Committee evaluated several aspects of the students' presentation skills. Table 1, below, summarizes the evaluations. In all cases, the students performed admirably under pressure. The members of industry who attend these presentations are skilled questioners, and have very high expectations of the seniors.

Table 1. Evaluations of Student Presentations

Category	Percent of Students Rated Very Good or Excellent
Appearance	64.8
Voice	63.1
Organization	61.5
Knowledge of Subject	58.7
Attitude	52.0
Discussion	50.8
Visual Aids	57.5

3. The examination designed to test computer skill level appears in Appendix II. Thirty students attempted the exam. A summary of the results of this exam appears in Table 2. Students were given a limited time period to complete this exam, and again performed admirably. Virtually all students showed a good grasp of basic spreadsheet and word processing skills. The more advanced functions are not as well mastered, particularly in word processing.

Table 2. Computer Skill Examination Results

Skill	# of successful attempts
Spreadsheet	
Data entry	30
Formulae	29
Graph - single data series	30
Graph - multiple data series	22
Statistics	14
Word Processing	
Table	30
Graph	27
Equation editor	5
Advanced formatting	9
Drawing	1

Notes

- Use of statistical function in the spreadsheet was not required for the problem. It made the calculations easier when used appropriately.
- The only requirements on the document were inclusion of tables and graphs. Use of the equation editor and the inclusion of drawings was entirely optional.
- There was a severe time limit on this exam; students both solved a problem and prepared a document in one hour. These results reflect a combination of problem solving ability and computer skill. Those who took longer to solve the problem did not produce quality documents.

### **Plans/Implications**

This is the first year that Paper Science has performed any formal assessment of graduating seniors. We plan to spend the next two years gathering data on these behavioral objectives before evaluating any possible program changes.

### **Evaluation of the Assessment Process**

The three instruments used for assessment seemed to work well. It is possible that some of the questions on the comprehensive examination need to be rewritten to improve clarity. The faculty and staff will review all aspects of assessment before performing these activities this spring. We also wish to have some type of assessment of the seniors' writing skills, as this is part of our emphasis on communication skill development in the program. Gerry Ring will pursue opportunities for assessing students' writing ability, and documenting their improvement.

## APPENDIX I

### ASSESSMENT EXAM

1. What fibers cannot make paper?
  - a) Asbestos
  - b) Cotton
  - c) Hemp
  - d) Wood
2. What is the approximate consistency in a modern headbox?
  - a) 0.025%
  - b) 0.25%
  - c) 0.5%
  - d) 1.0%
3. What is not considered a dewatering device on a fourdrinier table?
  - a) Dandy rolls
  - b) Flatboxes
  - c) Hydrofoils
  - d) Table rolls
4. What is the fourdrinier wire turning roll that is nearest to the headbox?
  - a) Breast
  - b) Couch
  - c) Guide
  - d) Holy
5. When a wet press nip becomes saturated the sheet defect that occurs is known as?
  - a) Crushing
  - b) Picking
  - c) Two-sidedness
  - d) Warping
6. What is the purpose of a flotation cell?
  - a) Collect condensate from dryer cylinders
  - b) Reclaim fibers after TMP refining
  - c) Remove ink particles
  - d) Wash pulp during bleaching
7. What coating process gives the most uniform thickness layer?
  - a) Air-knife
  - b) Blade
  - c) Gate-roll
  - d) Metered
8. What grade of paper can be produced at the fastest machine speeds?
  - a) Bleached Bristol
  - b) Bond
  - c) Newsprint
  - d) Tissue

9. What is an example of a physical paper property?
- Grammage
  - Stretch
  - Tensile
  - Tensile energy absorption
10. What is an example of a wet-strength agent?
- AKD
  - Corn starch
  - Kymene
  - Polyacrylamide
11. What ingredient is not necessary for the formation of a foam?
- Gas
  - Film stabilizing agents
  - Surfactants
  - Liquid
12. When should alum be added before rosin in acidic papermaking?
- When pH is above 6
  - When pH is below 3
  - When there is high anionic trash
  - When water hardness is high
13. Electrophoresis measures what important parameter?
- Saponification
  - Sedimentation potential
  - Streaming potential
  - Zeta potential
14. A  $1.0 \text{ m}^2$  blackbody cabinet wall has a temperature of 400 K. Compute the rate of heat transfer (W). The Stefan-Boltzmann constant is  $5.67 \times 10^{-8} \text{ W/m}^2\text{-K}^4$ .
- 1000
  - 1451
  - 2451
  - 252
15. A coin with an initial temperature of  $100 \text{ }^\circ\text{C}$  is plunged into a  $20 \text{ }^\circ\text{C}$  water bath. Assuming its thermal time constant is 1.0 minute, estimate its temperature ( $^\circ\text{C}$ ) after 2 minutes.
- 21.5
  - 23.9
  - 30.8
  - 49.4

16. A  $10.0 \text{ m}^2$  wall has a thickness of  $0.1 \text{ m}$  and a thermal conductivity of  $0.1 \text{ W/m-K}$ . Given a temperature differential of  $10 \text{ }^\circ\text{C}$ , how much heat does the wall transfer (W)?
- a) 50
  - b) 100
  - c) 150
  - d) 200
17. In an activated sludge process, a common MLSS level (in mg/l) would be:
- a) 2,000
  - b) 10,000
  - c) 20,000
  - d) 100,000
18. Water flows down through a porous pulp fiber mat. If Darcy's law or the Kozeny-Carman equation is obeyed, doubling the superficial approach velocity and tripling the thickness of the fiber mat increases of pressure drop by:
- a)  $2/3$
  - b)  $3/2$
  - c) 6
  - d) 12
19. Which of the variables listed below would influence the value of the specific resistance of a suspension of fiber fines and clay:
- a) Fluid viscosity
  - b) Dimensions of fiber fines and clay particles
  - c) Superficial velocity
  - d) All of the above
20. Which of the following is an intensive thermodynamic property:
- a) Mass (kg)
  - b) Volume ( $\text{m}^3$ )
  - c) Enthalpy (kJ)
  - d) Temperature (K)
21. The enthalpy of superheated steam entering a adiabatic turbine that is 75% efficient is  $3,000 \text{ kJ/kg}$ . The exhaust enthalpy is  $2,500 \text{ kJ/kg}$ . The work performed (kJ/kg) is:
- a) 125
  - b) 375
  - c) 500
  - d) 625

22. The enthalpy of superheated steam entering (at zero velocity) a converging-diverging adiabatic nozzle is 3,000 kJ/kg. The enthalpy at the nozzle exit is 2,500 kJ/kg. The steam velocity (m/s) at the nozzle exit is:
- 10
  - 100
  - 500
  - 1000
23. A reversible Carnot heat engine operates between a high temperature reservoir of 600 K and a low temperature reservoir of 300 K. Its efficiency is:
- 25%
  - 50%
  - 60%
  - 70 %
24. The flow of water in a pipe has a Reynolds number of 200. The velocity at the pipe center is how many times the mean velocity:
- one-half
  - the same
  - double
  - four times
25. The viscosity of gases, in general, is
- more sensitive to temperature than liquid viscosity
  - less sensitive to temperature than liquid viscosity
  - insensitive to temperature
26. If the compressibility factor for a real gas is less than one, the predicted density of the gas will be \_\_\_\_\_ the density predicted by the ideal gas law.
- lower than
  - higher than
  - the same as
27. For an adiabatic system with no moving parts, which terms may be neglected in the open system energy balance?
- enthalpy change and flow work
  - shaft work and heat
  - shaft and flow work
  - heat and flow work
28. Which of the following is not a contributor to the odor from a Kraft mill?
- Methylmercaptans
  - dimethyldisulfide
  - methanol
  - dimethylsulfide

29. The commonly accepted meaning of ECF
- elemental chlorine free
  - entirely chlorine free
  - especially chlorine free
  - expensive chlorine free
30. The operation which separates particles primarily on the basis of density
- cleaning
  - screening
  - cooking
  - washing
31. Reaction wood
- protects trees from parasites
  - is highly beneficial for pulping
  - keeps the tree vertical
  - grows only in the crown of the tree
32. The chemical reaction primarily responsible for strength loss during pulping
- delignification
  - cellulose chain cleavage
  - peeling
  - aromatic substitution
33. The  $R^2$  value for a regression analysis indicates
- the fraction of the variability in y that comes from changing x
  - the total variability in the data set
  - how linear the relationship between x and y is
  - how good your data collection plan was
34. Increasing the number of terms in your regression equation
- increases  $R^2$
  - decreases  $R^2$
  - does not change  $R^2$
  - eliminates  $R^2$
35. The variance of a set of data is the \_\_\_\_\_ of the standard deviation
- square
  - square root
  - sine
  - negative
36. Chlorine dioxide solubility in water is \_\_\_\_\_ at lower temperatures.
- the same
  - higher
  - lower

37. The reduced temperature of a material is the ratio of the system temperature to the
- boiling temperature
  - melting temperature
  - glass transition temperature
  - critical temperature
38. On an open head box machine, doubling the wire speed will require \_\_\_\_\_ the level of stock in the headbox.
- not changing
  - doubling
  - tripling
  - quadrupling
39. An investment of \$1000 made today at 8% per annum, compounded annually will be worth \_\_\_\_\_ ten years from now.
- \$1562
  - \$2159
  - \$2647
  - \$2984
40. Increasing refining will move the dry line on a Fourdrinier table
- toward the headbox
  - toward the couch
  - not at all
  - under the dandy roll
41. Saturated steam at a pressure of 75 psig will have a temperature of approximately
- 187 °F
  - 221 °F
  - 293 °F
  - 347 °F
42. Primary control of basis weight on a paper machine is made by adjusting the
- slice opening
  - slide adjusting screws or thermal rods
  - the thick stock valve
  - the fan pump speed
43. On most paper machines, basis weight profile is controlled by adjusting the
- thick stock valve
  - shape of the slice opening
  - press roll crown
  - thick stock consistency

44. In an evaporator system, the total pounds of water evaporated per pound of boiler house steam used is called
- steam efficiency
  - steam economy
  - steam use
  - steam effectiveness
45. For process control purposes, many pulp and paper processes can be modeled as \_\_\_\_\_ processes.
- first order
  - first order plus dead time
  - dead time
  - second order
46. A first order process will achieve \_\_\_\_\_ of its ultimate response in a period of time equal to one time constant.
- approximately 50%
  - approximately 60%
  - approximately 70%
  - approximately 80%
47. The integral mode of feedback control eliminates \_\_\_\_\_.
- error
  - offset
  - oscillation
  - slow response
48. When the tending end of a felt guide roll in the felt return run is moved toward the couch the felt will
- move to the tending side
  - move to the back side
  - tighten
  - stay where it is
49. Most forming fabrics are made of
- nylon
  - brass
  - polyester
  - kevlar
50. The appropriate units for thermal conductivity might be
- Btu/hr-ft-°F
  - Btu/hr-sq. ft-°F
  - cal/gm-°C
  - Btu/lb.-°F

## APPENDIX II

### COMPUTER SKILLS ASSESSMENT

UNIVERSITY OF WISCONSIN – STEVENS POINT  
PAPER SCIENCE DEPARTMENT

Paper Science 430 – Mass Transfer Operations  
Gas Absorption Exam and Computer Skills Assessment

A mill uses an absorption tower to capture  $\text{ClO}_2$ . The entering gas is 5 mole percent  $\text{ClO}_2$ , and the gas leaving the absorber is 10 ppm  $\text{ClO}_2$ . The liquid used in the tower is chilled water at  $10^\circ\text{C}$ , flowing at 2275 gpm. The gas flow rate to the tower is 10,000 scfm. Solubility data for  $\text{ClO}_2$  /water at  $10^\circ\text{C}$  appears below. The molecular weight of  $\text{ClO}_2$  is 67.45. You may assume that the density of the solution is 1000 g/l.

Prepare a brief memo containing a table of the solubility data, a graph of the absorber operation which includes both the operating and equilibrium lines, and the results of your calculation of the ratio of the  $(L/V)_{\text{operating}}$  to  $(L/V)_{\text{min}}$ . Submit both the report and your spreadsheet in a single email message to [kbiasca@uwsp.edu](mailto:kbiasca@uwsp.edu)

Solubility Data,  $10^\circ\text{C}$

Mole fraction, gas	$\text{ClO}_2$ in water, g/l
0.01	1.25
0.03	3.85
0.05	6.3
0.07	8.95
0.1	12.8
0.11	14.0
0.12	15.3

EXTRA CREDIT QUESTIONS

1. What is the mole fraction of  $\text{ClO}_2$  in the liquid at the bottom of the tower?
2. What is  $N_{oy}$  for this tower?

## Assessment Report

Paper Science Department

1997-98 Academic Year

### **Behavioral Objectives for Paper Science Graduates**

Graduates of the Paper Science program at the University of Wisconsin - Stevens Point have the greatest potential for success in their professional lives if they possess the following attributes:

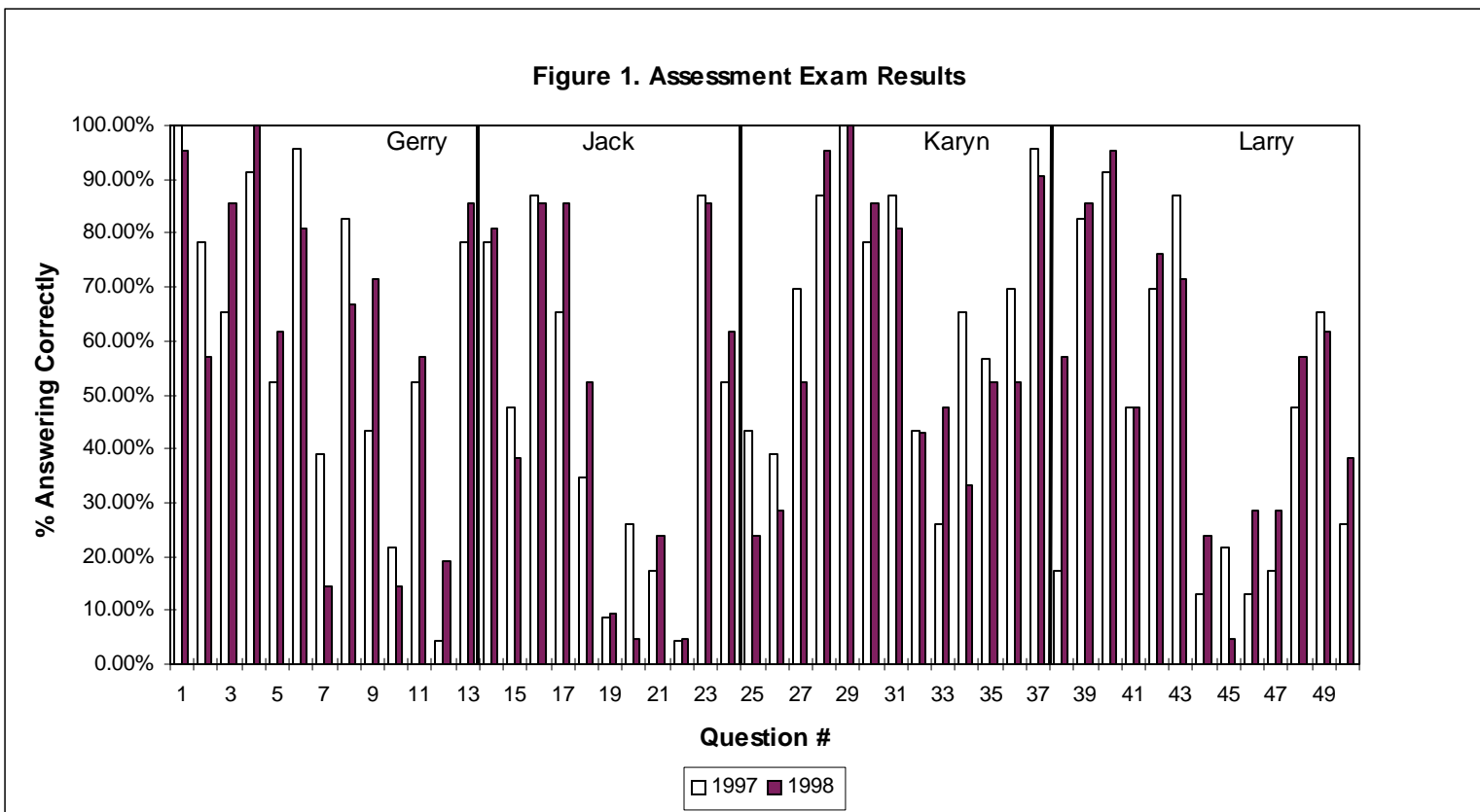
1. Fundamental knowledge of pulp and paper raw materials and processes
2. Excellent communication skills
3. A high level of computer literacy
4. The ability to work effectively as part of a team
5. A professional comportment
6. The ability to continue learning

The faculty and academic staff in the Department discussed possible measurements of these objectives. We decided to continue our focus on the first three objectives in our assessment activity. We added one more assessment tool, designed to measure improvement in student writing. The assessments conducted during Spring 1998 are listed below, numbered by objective.

1. Students attempted a comprehensive exam designed by the Paper Science faculty. The purpose of this exam is to assess the level of student knowledge of pulp and paper technology and engineering.
2. The feedback from industry members on student presentations at the Academic Advisory Committee meeting, held on May 14, 1998 is summarized in this report. We also present the results of a writing assessment of the seniors. Seniors provided a writing sample, which was subsequently evaluated by the English Department. We compared these results to the students' scores on their English placement exam from their first year at UWSP.
3. The seniors performed an analysis of a screen system problem using a spreadsheet, producing graphical and tabular output. The graphs and tables were transferred into the word processing application to produce a short report on the problem solution.

## Results

- The comprehensive examination had fifty questions, covering all major subject areas in the Paper Science curriculum. The actual exam questions appear in the Appendix to this report. Gerry Ring wrote questions 1-13, covering paper and fiber physics, wet end chemistry, and paper manufacture. Jack Maxham wrote questions 14-24, covering the engineering topics of fluid mechanics, thermodynamics, heat and mass transfer. Karyn Biasca wrote questions 25-37, concerning wood and pulping technology, and basic material and energy balance calculations. Larry Graham contributed questions 38-50, covering process control, fluid mechanics, and paper manufacture. The average score on this exam was 28, with a range from 15 to 35. Figure 1 shows the question by question breakdown of the students' responses. This group of students again appears to have a better grasp of the "technology" questions (Gerry's and Karyn's) than the engineering questions. Several of the questions have resulted in poor performance by the students in both groups, and warrant some review of their wording, content, and clarity.



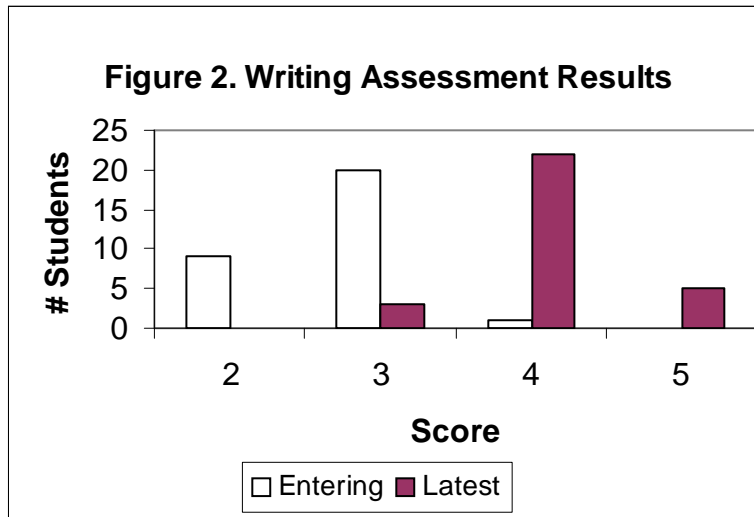
- Industry attendees at the student presentations during the May meeting of the Paper Science Academic Advisory Committee evaluated several aspects of the students' presentation skills. Table 1, below, summarizes the evaluations.

In all cases, the students performed admirably under pressure. The members of industry who attend these presentations are skilled questioners, and have very high expectations of the seniors.

Table 1. Evaluations of Student Presentations

Category	Percent of Students Rated Very Good or Excellent
Appearance	74
Voice	68
Organization	67
Knowledge of Subject	57
Attitude	50
Discussion	58
Visual Aids	75

The writing assessment results appear in Figure 2. Possible scores on the writing samples range from 1 to 5, with 5 corresponding to high level writing skills. The chart clearly shows a significant improvement in students' writing ability over their university careers.



3. The examination designed to test computer skill level appears in Appendix II. Twenty-one students attempted the exam. A summary of the results of this exam appears in Table 2. Students were given unlimited time to complete this exam, and performed admirably. Virtually all students showed a good grasp of basic and advanced spreadsheet and word processing skills.

Table 2. Computer Skill Examination Results

Skill	# of successful attempts
Spreadsheet	
Data entry	21
Formulae	21
Graph - single data series	21
Graph - multiple data series	20
Statistics	0*
Word Processing	
Table	21
Graph	21
Equation editor	0*
Advanced formatting	9
Drawing	19

\* not required for this problem

### **Plans/Implications**

This is the second year that Paper Science has performed any formal assessment of graduating seniors. We plan to spend one more year gathering data on these behavioral objectives before evaluating any possible program changes.

### **Evaluation of the Assessment Process**

The four instruments used for assessment work well. It is possible that some of the questions on the comprehensive examination need to be rewritten to improve clarity. The assessment of the seniors' writing skills was a valuable addition to our assessment activities.

## APPENDIX

### ASSESSMENT EXAM

1. What fibers cannot make paper?
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  - b) Cotton
  - c) Hemp
  - d) Wood
2. What is the approximate consistency in a modern headbox?
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19. Which of the variables listed below would influence the value of the specific resistance of a suspension of fiber fines and clay:
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  - d) 1000
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  - especially chlorine free
  - expensive chlorine free
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  - screening
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  - does not change  $R^2$
  - eliminates  $R^2$
35. The variance of a set of data is the \_\_\_\_\_ of the standard deviation
- square
  - square root
  - sine
  - negative
36. Chlorine dioxide solubility in water is \_\_\_\_\_ at lower temperatures.
- the same
  - higher
  - lower

37. The reduced temperature of a material is the ratio of the system temperature to the
- boiling temperature
  - melting temperature
  - glass transition temperature
  - critical temperature
38. On an open head box machine, doubling the wire speed will require \_\_\_\_\_ the level of stock in the headbox.
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- \$1562
  - \$2159
  - \$2647
  - \$2984
40. Increasing refining will move the dry line on a Fourdrinier table
- toward the headbox
  - toward the couch
  - not at all
  - under the dandy roll
41. Saturated steam at a pressure of 75 psig will have a temperature of approximately
- 187 °F
  - 221 °F
  - 293 °F
  - 347 °F
42. Primary control of basis weight on a paper machine is made by adjusting the
- slice opening
  - slide adjusting screws or thermal rods
  - the thick stock valve
  - the fan pump speed
43. On most paper machines, basis weight profile is controlled by adjusting the
- thick stock valve
  - shape of the slice opening
  - press roll crown
  - thick stock consistency

44. In an evaporator system, the total pounds of water evaporated per pound of boiler house steam used is called
- steam efficiency
  - steam economy
  - steam use
  - steam effectiveness
45. For process control purposes, many pulp and paper processes can be modeled as \_\_\_\_\_ processes.
- first order
  - first order plus dead time
  - dead time
  - second order
46. A first order process will achieve \_\_\_\_\_ of its ultimate response in a period of time equal to one time constant.
- approximately 50%
  - approximately 60%
  - approximately 70%
  - approximately 80%
47. The integral mode of feedback control eliminates \_\_\_\_\_.
- error
  - offset
  - oscillation
  - slow response
48. When the tending end of a felt guide roll in the felt return run is moved toward the couch the felt will
- move to the tending side
  - move to the back side
  - tighten
  - stay where it is
49. Most forming fabrics are made of
- nylon
  - brass
  - polyester
  - kevlar
50. The appropriate units for thermal conductivity might be
- Btu/hr-ft-°F
  - Btu/hr-sq. ft-°F
  - cal/gm-°C
  - Btu/lb.-°F

ASSESSMENT REPORT  
PAPER SCIENCE DEPARTMENT  
1998-99 ACADEMIC YEAR

**Behavioral Objectives for Paper Science Graduates**

Graduates of the Paper Science program at the University of Wisconsin - Stevens Point have the greatest potential for success in their professional lives if they possess the following attributes:

1. Fundamental knowledge of pulp and paper raw materials and processes
2. Excellent communication skills
3. A high level of computer literacy
4. The ability to work effectively as part of a team
5. A professional comportment
6. The ability to continue learning

**Assessment Methods**

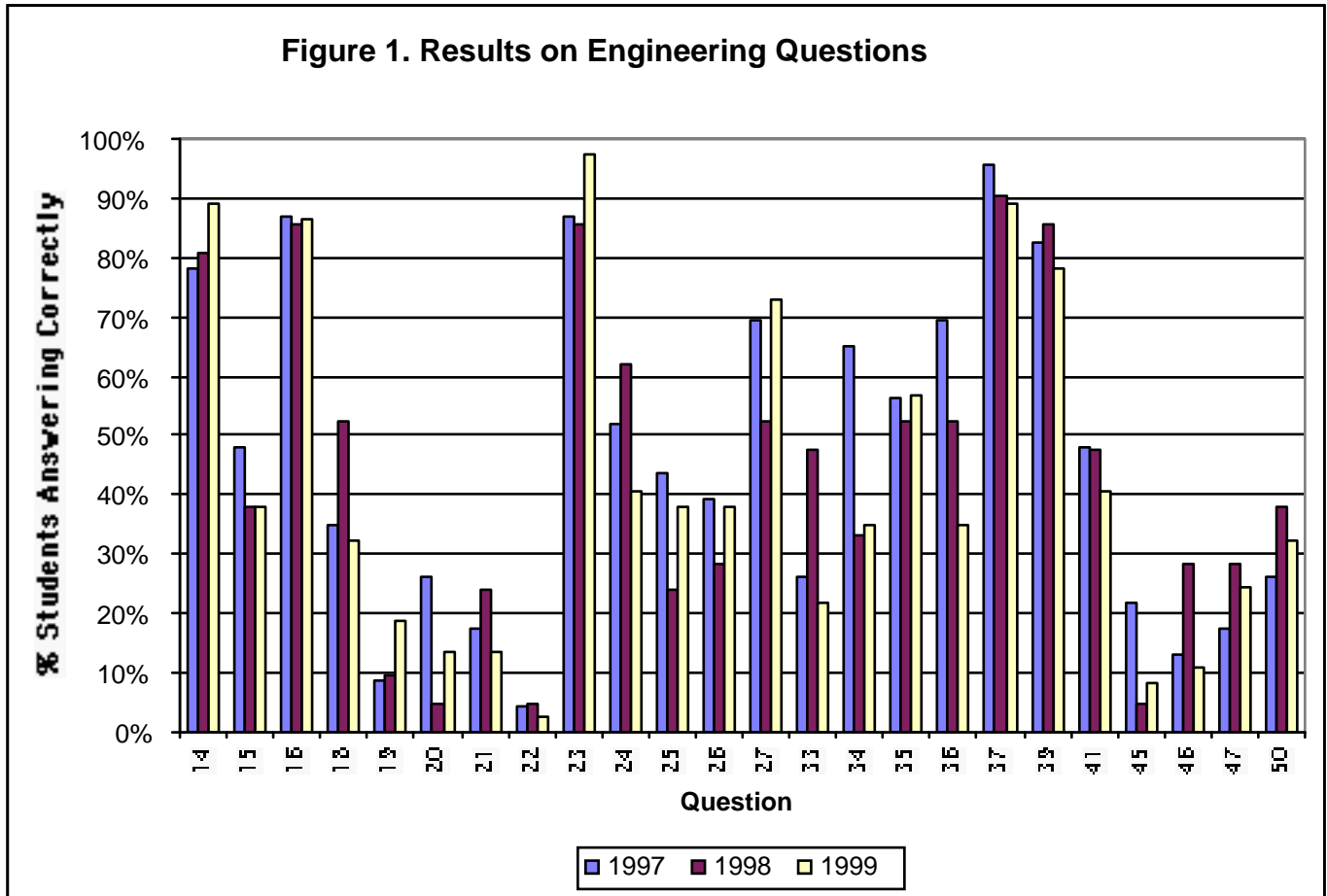
The faculty and academic staff in the Department discussed possible measurements of these objectives. We decided to continue our focus on the first three objectives in our assessment activity. We added one more assessment tool, designed to measure improvement in student writing. The assessments conducted during the 1998-99 academic year are listed below, numbered by objective.

1. Students attempted a comprehensive exam designed by the Paper Science faculty. The purpose of this exam is to assess the level of student knowledge of pulp and paper technology and engineering.
2. The feedback from industry members on student presentations at the Academic Advisory Committee meeting, held in May 1999 is summarized in this report. We also present the results of a writing assessment of the seniors. Seniors provided a writing sample, which was subsequently evaluated by the English Department. We compared these results to the students' scores on their English placement exam from their first year at UWSP.
3. Paper Science seniors take a computer simulation course during the Fall Semester. The results from students' work in this course during Fall Semester 1998 serve as this year's assessment of the computer literacy for our graduates. The activities include several spreadsheet projects, a large project using software designed for the pulp and paper industry, and the reports from these projects.

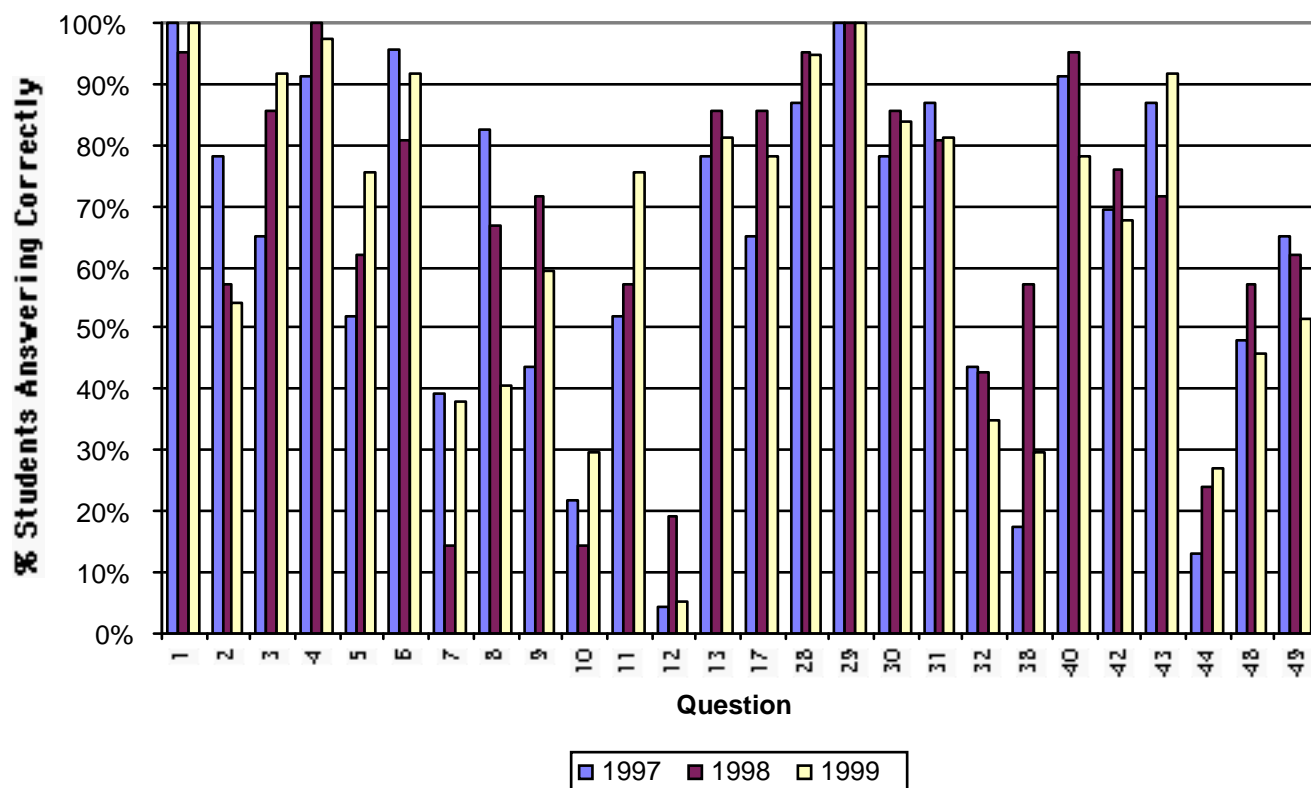
In addition to the department specific assessment activities, the Paper Science seniors have participated in the campus wide assessment effort by taking the ACT-COMP exam.

## Results

1. The comprehensive examination had fifty questions, covering all major subject areas in the Paper Science curriculum. The actual exam questions appear in the Appendix to this report. The questions may be split into two categories: questions that test engineering knowledge, and questions about pulp and paper industry technology. There are twenty-three engineering questions and twenty-seven technology questions on the exam. Figures 1 and 2 show the results from the past three years' examinations. We clearly have some questions on this exam that the students consistently miss.



**Figure 2. Results on Technology Questions**



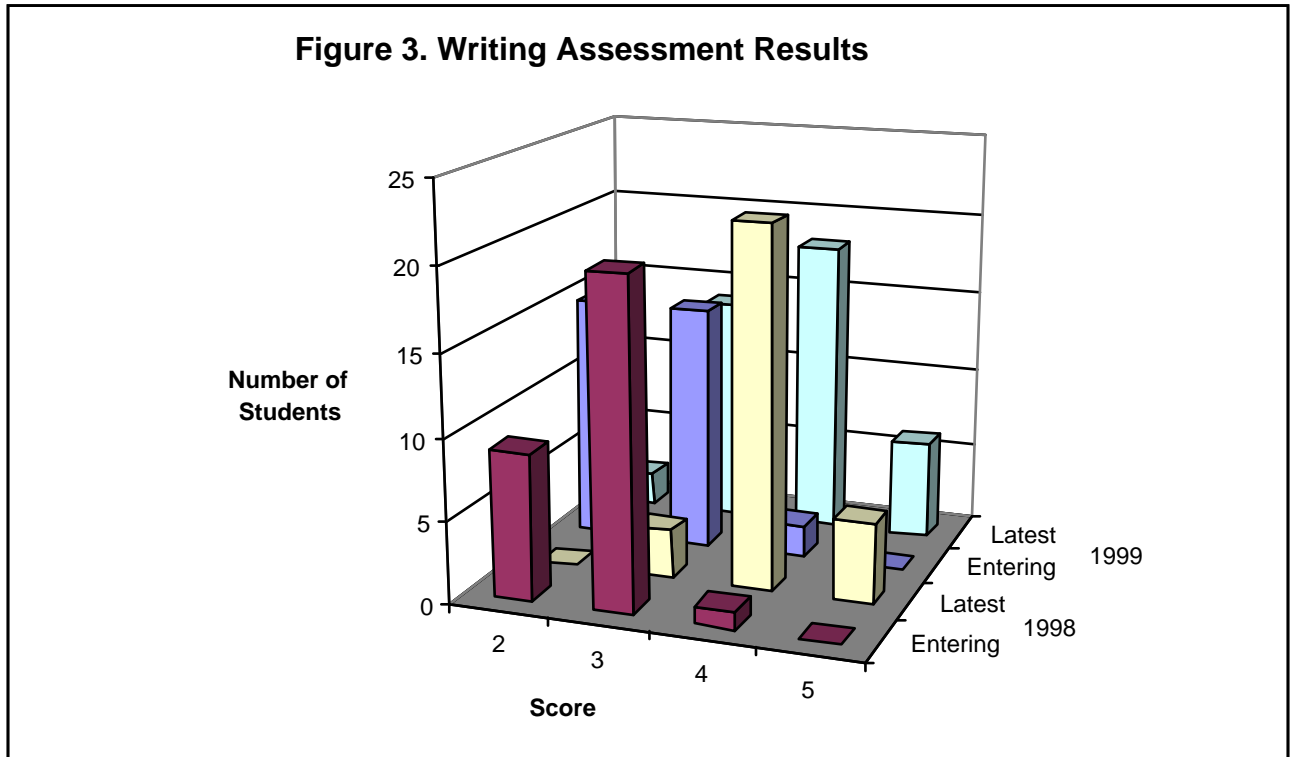
2. Industry attendees at the student presentations during the May meeting of the Paper Science Academic Advisory Committee evaluated several aspects of the students' presentation skills. Table 1, below, summarizes the evaluations. In all cases, the students performed admirably under pressure. The members of industry who attend these presentations are skilled questioners, and have very high expectations of the seniors, so this high rating of the seniors is gratifying to the department.

**Table 1. Evaluations of Student Presentations**

Category	Students Rated Very Good or Excellent
Appearance	90.06%
Voice	82.46%
Organization	84.80%
Knowledge of Subject	81.87%
Attitude	80.70%
Discussion	87.72%
Visual Aids	74.85%

The writing assessment results appear in Figure 3. Possible scores on the writing samples range from 1 to 5, with 5 corresponding to high level writing

skills. The chart clearly shows a significant improvement in students' writing ability over their university careers.



3. A summary of the evaluation of the computer simulation projects appears in Table 2. Clearly, the seniors are well prepared to perform standard computer tasks.

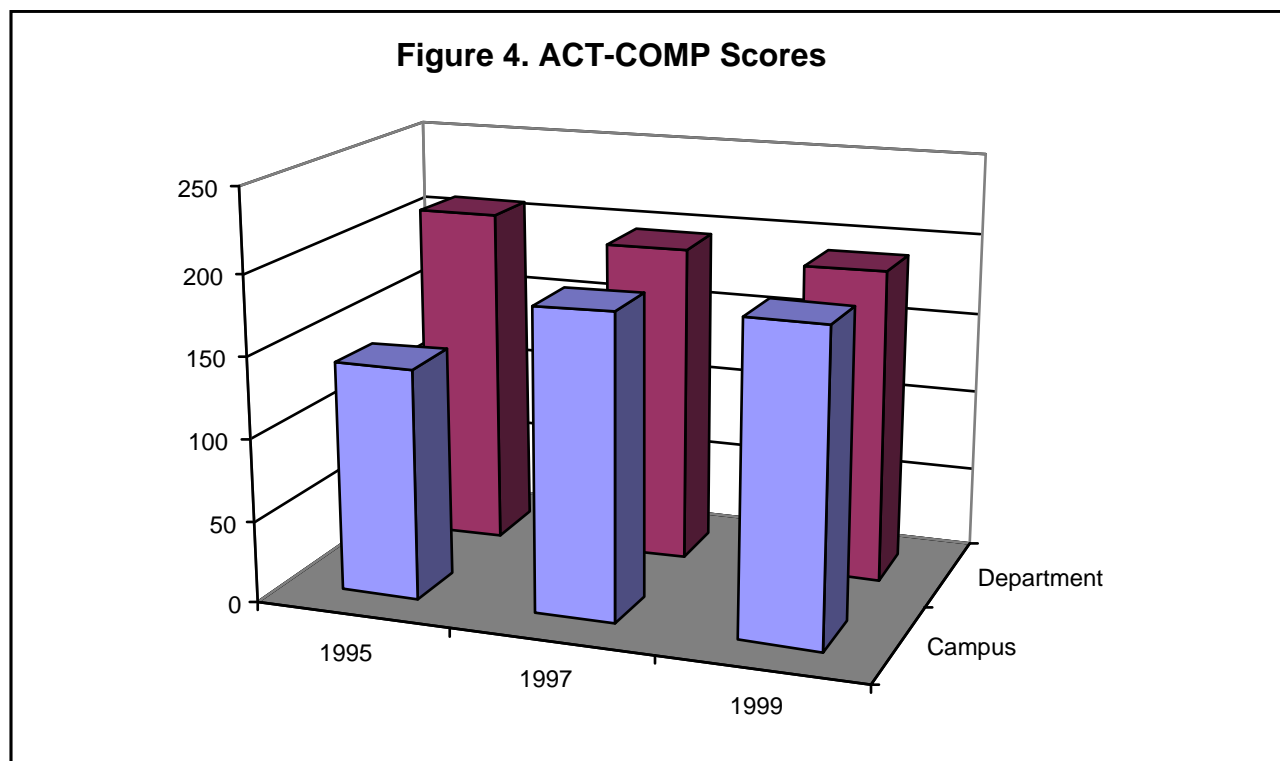
Table 2. Computer Skills Results

Skill	successful attempts, %
Spreadsheet	
Data entry	100
Formulae	100
Graph - single data series	100
Graph - multiple data series	100
Statistics	97
Word Processing	
Table	100
Graph	100
Equation editor	100
Advanced formatting	100
Drawing	95

The seniors also developed a high level of proficiency with a computer simulation program designed specifically for the pulp and paper industry. The software is called WinGEMS, and is widely used in our industry. The experience that the seniors have with this software will help them in their positions as process engineers, in that it will allow them to evaluate potential changes in mill processes on the computer before dedicating resources to projects.

## ACT-COMP RESULTS

Paper Science seniors participated in the ACT-COMP examination in 1995, 1997



and 1999. Our seniors fared well on this examination, as shown in Figure 4.

## PLANS/IMPLICATIONS

The Paper Science faculty, in general, is pleased with the results from our assessment efforts. The results suggest action plans in the areas assessed.

We have some concerns about the examination administered to the seniors. There are clearly several questions that the students have trouble with, year after year. We, as a faculty, must review these questions to determine whether the students miss them because the questions are not clear or because the students do not understand and retain the concepts. We may then take appropriate action.

Our seniors demonstrate consistently high proficiency in communication skills, both oral and written. We will continue our departmental commitment to developing these critical career skills.

The level of computer literacy demonstrated by our graduates is also very high. We continue to find innovative ways to integrate computer use into our course work, including use of the Internet. This departmental commitment will continue to serve our graduates well.

## **ASSESSMENT DISSEMINATION**

We share our assessment results with our industry support organizations, primarily through our Academic Advisory Committee and the Paper Science Foundation. Paper industry representatives have very favorable reactions to our assessment efforts and results, and have contributed ideas for other assessment techniques. We continue to evaluate their ideas for applicability in the academic setting.

We plan to begin sharing the assessment results with the students this year.

**ASSESSMENT REPORT  
PAPER SCIENCE DEPARTMENT  
2000-2001 ACADEMIC YEAR**

**Behavioral Objectives for Paper Science Graduates**

Graduates of the Paper Science program at the University of Wisconsin - Stevens Point have the greatest potential for success in their professional lives if they possess the following attributes:

1. Fundamental knowledge of pulp and paper raw materials and processes
2. Excellent communication skills
3. A high level of computer literacy
4. The ability to work effectively as part of a team
5. A professional comportment
6. The ability to continue learning

The faculty in the Department continues our discussion of these objectives. We decided to continue our focus on the first three objectives in our assessment activity. The assessment activities conducted during Spring 2001 are listed below, numbered by objective.

1. During the Fall 1999 Semester, the faculty devoted several faculty meetings to the revision of the Paper Science Knowledge Exam. Based on results from the previous three years of assessment, we reviewed the questions that were answered correctly by more than 90% or less than 50% of the students taking the exam. We carefully considered each of these questions, and made several changes in the exam. Graduating seniors then took the revised exam in the Spring Semesters of 2000 and 2001.
2. The feedback from industry members on student presentations at the Academic Advisory Committee meeting held in May 2001 is summarized in this report. We also present the results of writing assessments conducted over the past four years on the seniors. Seniors provided a writing sample, which was subsequently evaluated by the English Department. We compared these results to the students' scores on their English placement exam from their first year at UWSP.
3. All Paper Science majors must take a computer simulation course. Their level of computer literacy is judged by their performance in this course.

**Results**

1. The comprehensive examination has fifty questions, covering all major subject areas in the Paper Science curriculum. The questions may be split into two categories: questions that test engineering knowledge, and questions

about pulp and paper industry technology. There are twenty-three engineering questions and twenty-seven technology questions on the exam. Figures 1 and 2 show the results from the past five years' examinations, including the revised questions in 2000 and 2001. The changes made in the questions gave improvement in the percentage of students answering correctly in some cases, but not all. We must continue our analysis of this exam, including some assistance from testing and evaluation experts on campus.

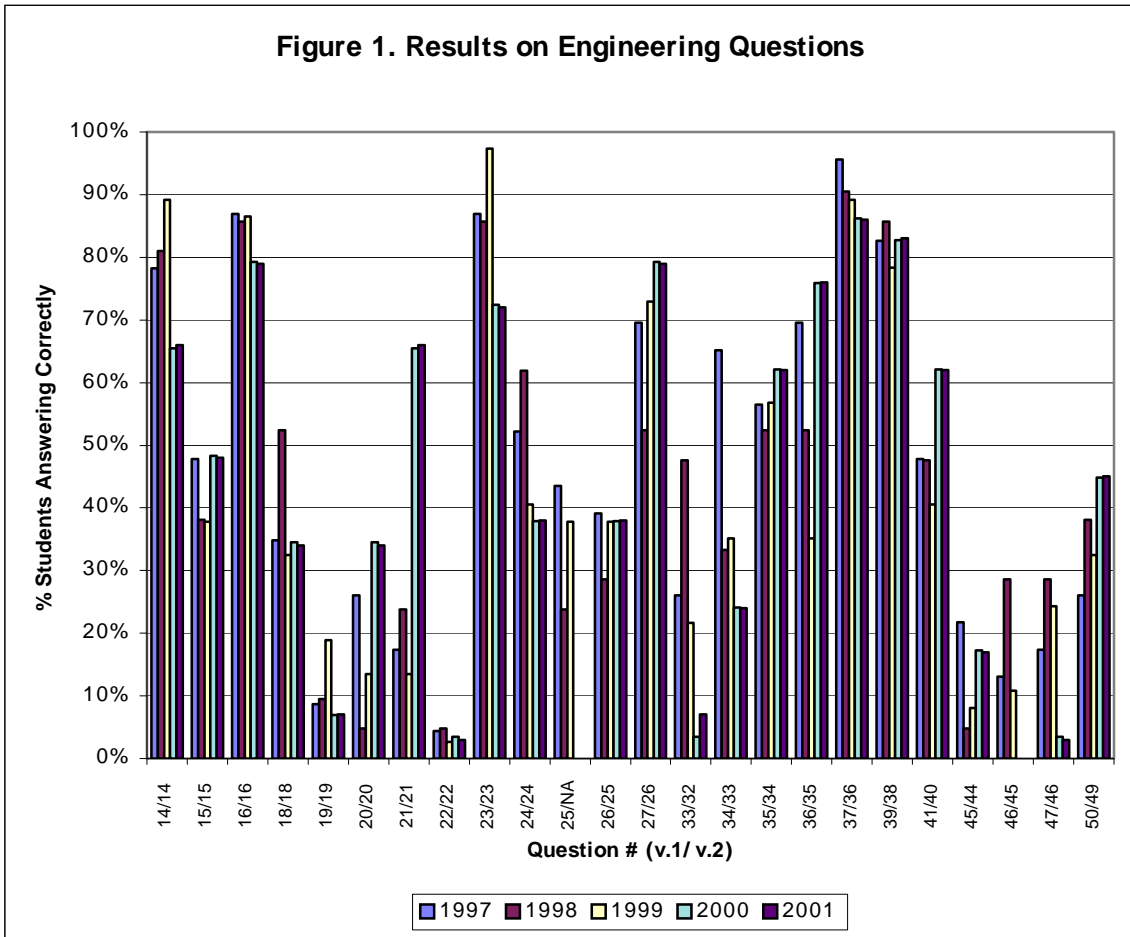
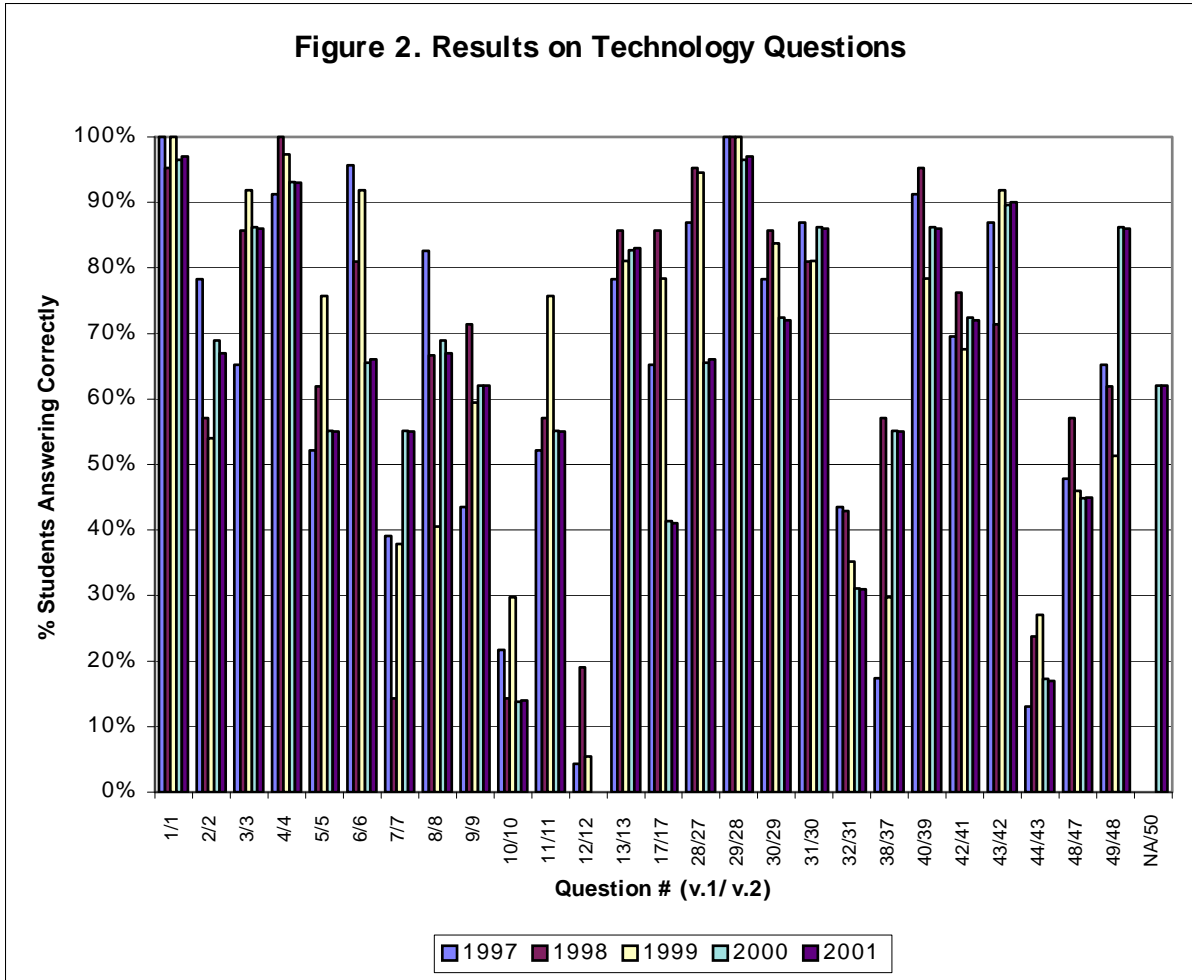


Figure 2. Results on Technology Questions



2. Industry attendees at the student presentations during the May meeting of the Paper Science Academic Advisory Committee evaluated several aspects of the students' presentation skills. Table 1, below, summarizes the evaluations. In all cases, the students performed admirably under pressure. The members of industry who attend these presentations are skilled questioners, and have very high expectations of the seniors, so this high rating of the seniors is gratifying to the department.

Table 1. Evaluations of Student Presentations

Category	Students Rated Very Good or Excellent
Appearance	92%
Voice	84%
Organization	84%
Knowledge of Subject	80%
Attitude	84%
Discussion	80%
Visual Aids	84%

The writing assessment results appear in Table 2. Possible scores on the writing samples range from 1 to 5, with 5 corresponding to high level writing skills. The table clearly shows a significant improvement in students' writing ability over their university careers.

Table 2. Writing Scores for Paper Science Majors

Class of:		Score			
		2	3	4	5
1998	Entering	9	20	1	0
	Graduating	0	3	22	5
1999	Entering	15	15	2	0
	Graduating	2	14	18	6
2000	Entering	19	19	6	2
	Graduating	0	12	26	8
2001	Entering	21	20	3	0
	Graduating	0	11	28	5

3. Students demonstrated very high-level computer skills in the Paper Science 485 computer simulation course. The course requires students to use spreadsheets and industry specific software to model paper industry processes. All students developed a high degree of proficiency with this software, and all students earned As in the course.

## PLANS/IMPLICATIONS

The Paper Science faculty must continue to try to understand student performance on the Paper Science Knowledge Exam. We are still not sure whether the students miss questions because the questions are not clear or because the students do not understand and retain the concepts. We will enlist the help of testing experts on campus for assistance on this problem.

Our seniors demonstrate consistently high proficiency in communication skills, both oral and written. We will continue our departmental commitment to developing these critical career skills.

The level of computer literacy demonstrated by our graduates is also very high. We continue to find innovative ways to integrate computer use into our course work, including use of the Internet. This departmental commitment will continue to serve our graduates well.

### **ASSESSMENT DISSEMINATION**

We share our assessment results with our industry support organizations, primarily through our Academic Advisory Committee and the Paper Science Foundation. Paper industry representatives have reacted very favorably to our assessment efforts and results, and have contributed ideas for other assessment techniques. We continue to evaluate their ideas for applicability in the academic setting.

We share the assessment results with the seniors each year at the beginning of Spring Semester. We think that this helps the students to take the assessments seriously, even though their results are not tied to their graduation.

**Review of 1999-2001 Program Assessment Report**  
**UWSP Assessment Subcommittee**  
**Kirby Throckmorton, Chair**

**Program: Paper Science**

According to the University Handbook, “The primary purpose of assessment is to improve student learning by making appropriate curricular and instructional changes.” Assessment is defined by Palomba and Banta in their article “Essentials of Successful Assessment,” as the “systematic collection, review and use of information undertaken for the purpose of improving student learning and development.” The UWSP Assessment Subcommittee has reviewed your Program Assessment Report and offers the following comments and suggestions with the above in mind. If there are questions or concerns, please contact the chair.

- 1. Goal/Objectives Assessed:** Goals are clearly stated. The department is encouraged to expand these into a broader set of objectives, learning outcomes, and expected performance levels. Specific learning outcomes are implied in the comprehensive exam questions, presentation rating scale, and writing scores.
- 2. Assessment Method:** Multiple methods are used to directly assess student learning: comprehensive exam of paper science knowledge, assessment of writing skills, feedback from industry members on student presentations, and demonstrated proficiency in using software to model paper industry processes.
- 3. Results:** Data are presented and discussed.
- 4. Plans/Implications:** The department plans to continue to emphasize the development of communication skills and computer literacy.
- 5. Planning/Budget Implications of Proposed Changes:** None reported.
- 6. Evaluation of Assessment Instrument:** The department continues to investigate the reasons why students do not do very well on some of the comprehensive exam questions.
- 7. Assessment Dissemination:** The department may want to consider sharing assessment results with all students. This provides students with information as to what the department values and that it is serious about using assessment information to improve the paper science program.
- 8. Changes Implemented because of Previous Assessment Results:** None reported.

**PROGRAM ASSESSMENT REPORT  
PAPER SCIENCE DEPARTMENT  
2001-2003**

**Department Mission**

The UWSP Paper Science program is committed to preparing students for successful technical careers in the pulp, paper and allied industries. This mission is accomplished by promoting excellence in instruction, undergraduate research opportunities, industrial internships, and involvement in professional organizations.

**Department Vision and Goals**

UWSP Paper Science will provide a premier undergraduate educational opportunity, preparing graduates to be valuable assets to the paper and allied industries. Graduates will be productive in the industrial setting virtually immediately, with a very short learning curve on the job. To realize this vision, Paper Science faculty will:

- Maintain currency with industrial developments
- Educate themselves in pedagogical techniques
- Use technological tools in coursework as appropriate
- Use and apply paper industry examples wherever possible in course work
- Incorporate the use of the department paper machine in course work where appropriate
- Incorporate environmental issues in coursework where appropriate
- Expose students to a wide variety of paper industry technologies
- Provide collaborative problem solving opportunities
- Promote pride in careers in the pulp, paper and allied industries

**Behavioral Objectives for Paper Science Graduates**

Graduates of the Paper Science program at the University of Wisconsin - Stevens Point have the greatest potential for success in their professional lives if they possess the following attributes:

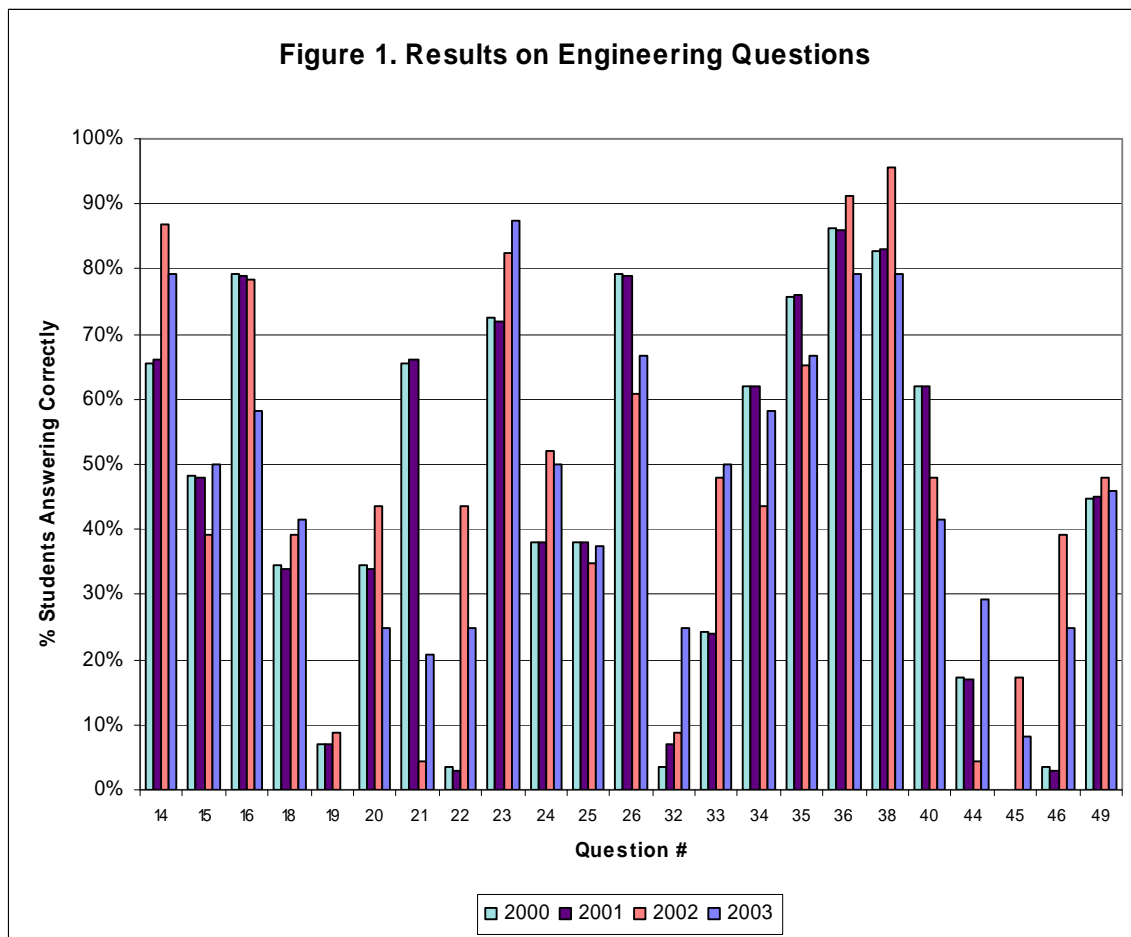
1. Fundamental knowledge of pulp and paper raw materials and processes
2. Excellent communication skills
3. A high level of computer literacy
4. The ability to work effectively as part of a team
5. A professional comportment
6. The ability to continue learning

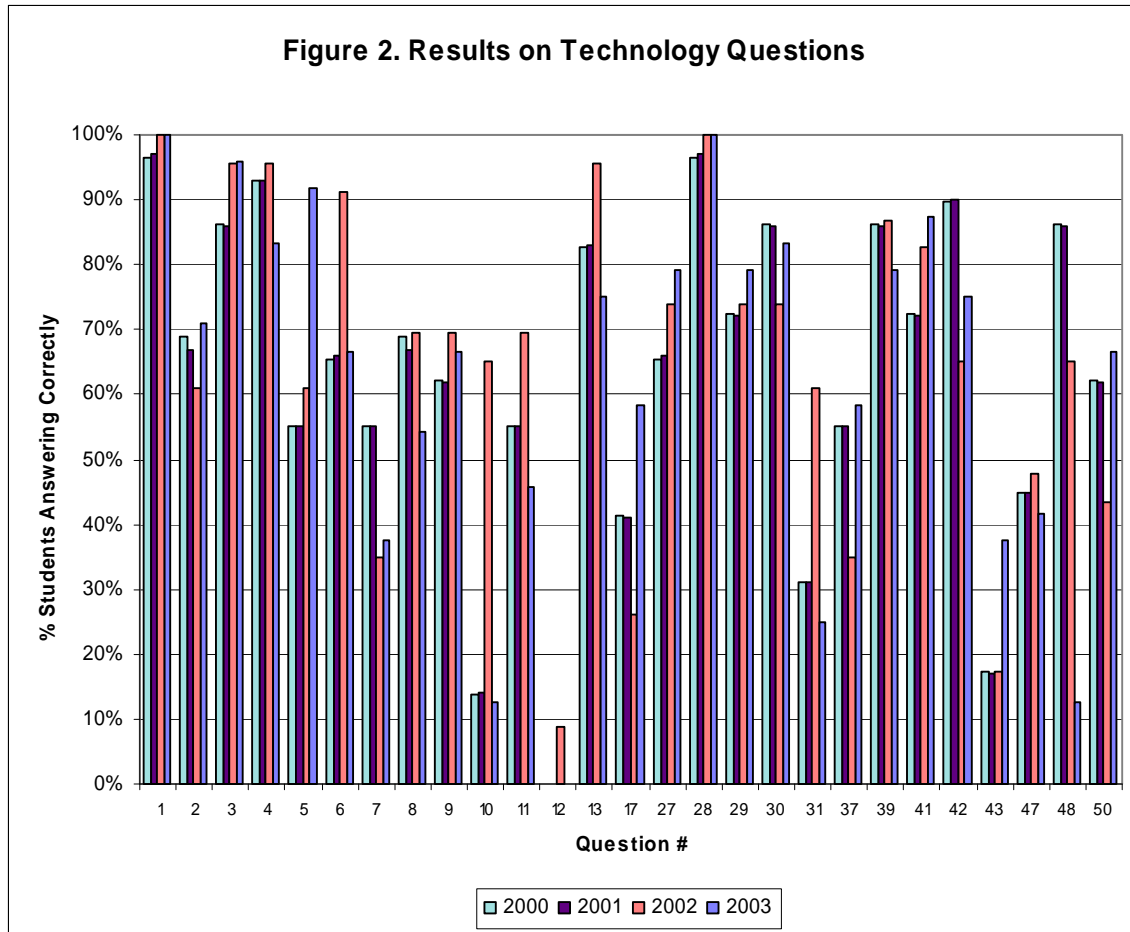
The faculty in the Department continues our discussion of these objectives. We decided to continue our focus on the first three objectives in our assessment activity. The assessment activities conducted during the 2001-2003 academic years are listed below, numbered by objective.

1. Gave the revised Paper Science Knowledge Exam to graduating seniors each year.
2. Obtained feedback from industry members on student presentations at the Academic Advisory Committee meeting held in May of each year. Graduating seniors provided a writing sample, which members of the English Department then evaluated. The English Department also provided students' scores on English placement exams from their first year at UWSP for comparison (except for 2003, see section 2 in Results section).
3. The level of computer literacy is judged by students' performance in a required computer simulation course.

### **Results**

1. The comprehensive examination has fifty questions, covering all major subject areas in the Paper Science curriculum. The questions may be split into two categories: questions that test engineering knowledge, and questions about pulp and paper industry technology. There are twenty-three engineering questions and twenty-seven technology questions on the exam. Figures 1 and 2 show the results from the past four years' examinations. There are still some questions that students consistently answer incorrectly. The faculty will analyze these questions to determine whether these questions are valid, need to be reworded, or discarded entirely.





2. Industry attendees at the student presentations during the May meeting of the Paper Science Academic Advisory Committee evaluated several aspects of the students' presentation skills. Table 1, below, summarizes the evaluations. In all cases, the students performed admirably under pressure. The members of industry who attend these presentations are skilled questioners, and have very high expectations of the seniors, so this high rating of the seniors is gratifying to the department.

Table 1. Evaluations of Student Presentations, 2003

Category	Students Rated Very Good or Excellent
Appearance	95%
Voice	81%
Organization	86%
Knowledge of Subject	83%
Attitude	81%
Discussion	90%
Visual Aids	76%

The writing assessment results appear in Table 2. Possible scores on the writing samples range from 1 to 5, with 5 corresponding to high level writing skills. The table clearly shows a significant improvement in students' writing ability over their university careers. The writing assessment for the 2003 graduates does not appear in the table because the entering placement scores for these students have been discarded by the English Department. The decision by the English Department to keep placement scores on file for only one year eliminates the possibility of comparing the entering and graduating scores.

Table 2. Writing Scores for Paper Science Majors

Class of:		Score			
		2	3	4	5
2000	Entering	19	19	6	2
	Graduating	0	12	26	8
2001	Entering	21	20	3	0
	Graduating	0	11	28	5
2002	Entering	17	10	3	0
	Graduating	2	3	23	2

3. Students demonstrated very high-level computer skills in the Paper Science 485 computer simulation course. The course requires students to use spreadsheets and industry specific software to model paper industry processes. All students developed a high degree of proficiency with this software, and all students earned As in the course.

### **PLANS/IMPLICATIONS**

The Paper Science faculty must continue to try to understand student performance on the Paper Science Knowledge Exam. We are still not sure whether the students miss questions because the questions are not clear or because the students do not understand and retain the concepts. We will study the correlation between the students' scores on the exam and the answers to the suspect questions. If the "difficult" questions cause more problems for the students who perform poorly on the test overall, then those questions may be doing a good job of discriminating between the students of greater and lesser ability. If there is no such correlation, these questions need to be examined more carefully, and possibly changed or discarded. Beginning this year, we will give this exam to our first and second year students to allow a pre- and post- assessment of their fundamental knowledge of pulp and paper technology.

Our seniors demonstrate consistently high proficiency in communication skills, both oral and written. We will continue our departmental commitment to developing these critical career skills. Unfortunately, the writing assessment effort will be curtailed for the next few years unless we can work out an arrangement with the English Department to retain English placement scores for our students until they graduate.

The level of computer literacy demonstrated by our graduates is also very high. We continue to find innovative ways to integrate computer use into our course work,

including use of the Internet. This departmental commitment will continue to serve our graduates well.

### **PLANS/BUDGET IMPLICATIONS OF PROPOSED CHANGES**

None known at this time.

### **EVALUATION OF ASSESSMENT INSTRUMENTS**

Overall, we are pleased with the assessment efforts that we have pursued thus far. Assessment of all areas should continue, with further exploration of assessment possibilities for Behavioral Objectives 4, 5 and 6. Alumni and industry surveys are possible solutions.

### **ASSESSMENT DISSEMINATION**

We share our assessment results with our industry support organizations, primarily through our Academic Advisory Committee and the Paper Science Foundation. Paper industry representatives have reacted very favorably to our assessment efforts and results, and have contributed ideas for other assessment techniques. We continue to evaluate their ideas for applicability in the academic setting.

We share the assessment results with the seniors each year at the beginning of Spring Semester. We think that this helps the students to take the assessments seriously, even though their results are not tied to their graduation.

### **CHANGES IMPLEMENTED BECAUSE OF PREVIOUS ASSESSMENT RESULTS**

None during the current period.

**Review of 2001-2003 Program Assessment Report**  
**UWSP Assessment Subcommittee**  
**Kirby Throckmorton, Chair**

**Program:** Paper Science

According to the University Handbook, “The primary purpose of assessment is to improve student learning by making appropriate curricular and instructional changes.” There are three basic questions: 1) What are students expected to learn? 2) Are they learning what is expected? 3) If not, what must be changed? The UWSP Assessment Subcommittee has reviewed your Program Assessment Report and offers the following recommendations with the above in mind. If there are questions or concerns, please contact the chair.

- 1. Goal/Objectives Assessed:** Recommendation—develop specific measurable learning outcomes for each objective and expected level of accomplishment. Outcomes for objective 1 can be extracted from the comprehensive exam. Outcomes for objective 3 can be based on categories in table 1.
- 2. Assessment Method:** Recommendation—develop well-defined rubrics, rating-scales, etc. for evaluation of student presentations, writing, team work and computer skills.
- 3. Results:** No recommendation.
- 4. Plans/Implications:** No recommendation.
- 5. Planning/Budget Implications of Proposed Changes:** No recommendation.
- 6. Evaluation of Assessment Instrument:** Recommendation—follow through on exploration of assessment possibilities.
- 7. Assessment Dissemination:** Recommendation—consider sharing assessment results with all students. This may alert them to the fact that you take their education seriously and are actively engaged in developing the best curriculum and instruction possible. It also communicates to them that they have a role to play in the assessment process in that their learning will eventually be assessed at the senior level.
- 8. Changes Implemented because of Previous Assessment Results:** No recommendation.

Overall—report is well done!

**PROGRAM ASSESSMENT REPORT  
PAPER SCIENCE DEPARTMENT  
2003-2005**

**Department Mission**

The UWSP Paper Science program is committed to preparing students for successful technical careers in the pulp, paper and allied industries. This mission is accomplished by promoting excellence in instruction, undergraduate research opportunities, industrial internships, and involvement in professional organizations.

**Department Vision and Goals**

UWSP Paper Science will provide a premier undergraduate educational opportunity, preparing graduates to be valuable assets to the paper and allied industries. Graduates will be productive in the industrial setting virtually immediately, with a very short learning curve on the job. To realize this vision, Paper Science faculty will:

- Maintain currency with industrial developments
- Educate themselves in pedagogical techniques
- Use technological tools in coursework as appropriate
- Use and apply paper industry examples wherever possible in course work
- Incorporate the use of the department paper machine in course work where appropriate
- Incorporate environmental issues in coursework where appropriate
- Expose students to a wide variety of paper industry technologies
- Provide collaborative problem solving opportunities
- Promote pride in careers in the pulp, paper and allied industries

**Behavioral Objectives for Paper Science Graduates**

Graduates of the Paper Science program at the University of Wisconsin - Stevens Point have the greatest potential for success in their professional lives if they possess the following attributes:

1. Fundamental knowledge of pulp and paper raw materials and processes
2. Excellent communication skills
3. A high level of computer literacy
4. The ability to work effectively as part of a team
5. A professional comportment
6. The ability to continue learning

The faculty in the Department continues our discussion of these objectives. We decided to continue our focus on the first three objectives in our assessment activity. The assessment activities conducted during the 2003-2005 academic years are listed below, numbered by objective.

1. Gave the revised Paper Science Knowledge Exam to seniors in 2004, but not 2005. See Plans/Implications section for more information.
2. Obtained feedback from industry members on student presentations at the Academic Advisory Committee meeting held in May of each year. Graduating seniors provided a writing sample, which members of the English Department then evaluated. The English Department also provided students' scores on English placement exams from their first year at UWSP for comparison.
3. The level of computer literacy is judged by students' performance in a required computer simulation course.

## **Results**

1. The comprehensive examination has fifty questions, covering all major subject areas in the Paper Science curriculum. The questions may be split into two categories: questions that test engineering knowledge, and questions about pulp and paper industry technology. There are twenty-three engineering questions and twenty-seven technology questions on the exam. The results on the final exam given to seniors were comparable to previous years, with an average score of approximately 50%, and students providing incorrect answers to the same questions as in previous classes. Due to our concerns about the utility of the exam, we had nine volunteers from our network of pulp and paper industry professionals take the exam and submit it for scoring. These individuals are successful engineers and managers in the industry; five are graduates of this program. The average score for this group was 46%, with the same questions causing difficulty as on the students' exams.
2. Industry attendees at the student presentations during the May meeting of the Paper Science Academic Advisory Committee evaluated several aspects of the students' presentation skills. Table 1, below, summarizes the evaluations. In all cases, the students performed admirably under pressure. The members of industry who attend these presentations are skilled questioners, and have very high expectations of the seniors, so this high rating of the seniors is gratifying to the department.

Table 1. Evaluations of Student Presentations, 2005

Category	Students Rated Very Good or Excellent
Appearance	100%
Voice	86%
Organization	71%
Knowledge of Subject	86%
Attitude	86%
Discussion	100%
Visual Aids	100%

The aggregated writing assessment results for all classes since 1998 appear on the next page in Figure 1. Possible scores on the writing samples range from 1 to 5, with 5 corresponding to high level writing skills. The table clearly shows a significant improvement in students' writing ability over their university careers.

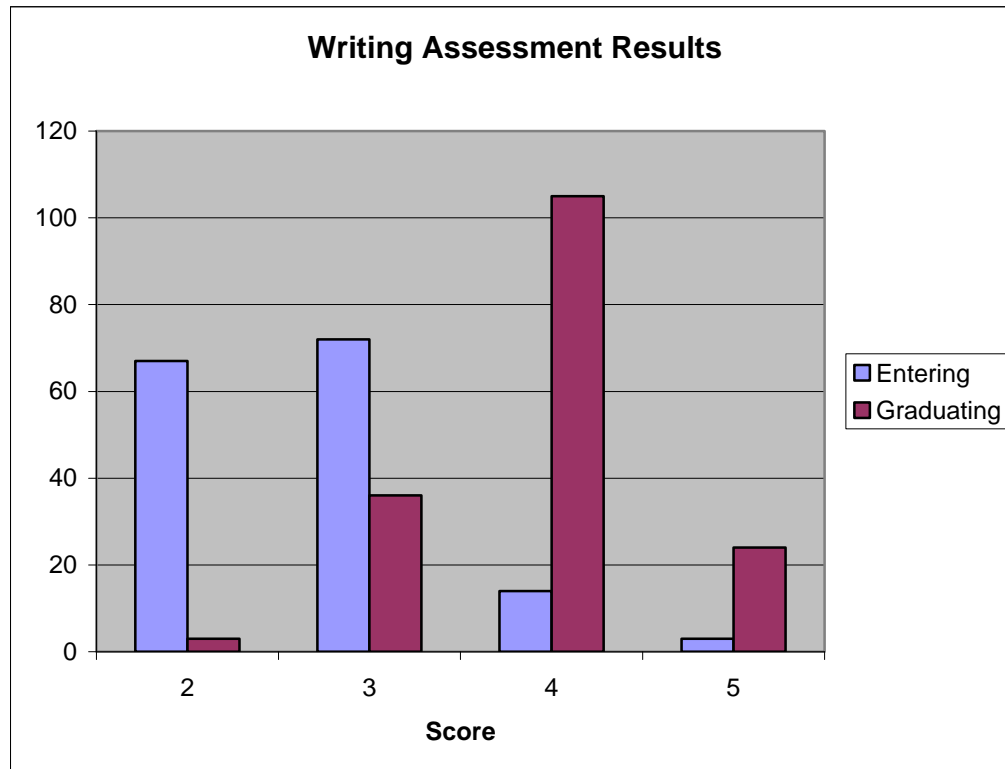


Figure 1. Writing Scores for Paper Science Majors

Students demonstrated very high-level computer skills in the Paper Science 485 computer simulation course. The course requires students to use spreadsheets and industry specific software to model paper industry processes. All students developed a high degree of proficiency with this software, and all students earned As in the course.

### **PLANS/IMPLICATIONS**

1. The Paper Science Knowledge Exam will no longer be included in the department assessment efforts. As a faculty, we feel that the test is not a good measure of our desired outcomes. We have already begun collecting data on authentic assessment activities, which will more accurately reflect how well our students perform on tasks related to their careers. We will discuss this more fully in the coming year, and our revised assessment plan (due in 2007) will reflect this change in approach.
2. Our seniors demonstrate consistently high proficiency in communication skills, both oral and written. We will continue our departmental commitment to developing these critical career skills.

3. The level of computer literacy demonstrated by our graduates is also very high. We continue to find innovative ways to integrate computer use into our course work, including use of the Internet. This departmental commitment will continue to serve our graduates well.

### **PLANS/BUDGET IMPLICATIONS OF PROPOSED CHANGES**

None known at this time.

### **EVALUATION OF ASSESSMENT INSTRUMENTS**

Assessment of all areas will continue, with further exploration of assessment possibilities for Behavioral Objectives 4, 5 and 6. Alumni and industry surveys are possible solutions.

### **ASSESSMENT DISSEMINATION**

We share our assessment results with our industry support organizations, primarily through our Academic Advisory Committee and the Paper Science Foundation. Paper industry representatives have reacted very favorably to our assessment efforts and results, and have contributed ideas for other assessment techniques. We continue to evaluate their ideas for applicability in the academic setting.

We share the assessment results with the seniors each year at the beginning of Spring Semester. We think that this helps the students to take the assessments seriously, even though their results are not tied to their graduation.

### **CHANGES IMPLEMENTED BECAUSE OF PREVIOUS ASSESSMENT RESULTS**

None during the current period.