2011-2012 Assessment Report

Agricultural & Biosystems Engineering Department

Programs:
Agricultural and Biosystems Engineering (ABEN)
Agricultural Systems Management (ASM)

A. Overview

The Department of Agricultural and Biosystems Engineering assessment committee is made up of five faculty members with resident teaching responsibility. However, all teaching faculty in our department have been actively involved in the various assessment activities and in the preparation of this report.

The faculty meet a number of times each semester to discuss assessment activities and to plan changes that might be made to improve teaching/learning and to discuss appropriate learning assessment methods to be implemented during the year. New information on assessment methods is shared between faculty via e-mail or hard copy. Methods to assess our students' attainment of student outcomes include assessment at the program and individual course levels. The program level assessment methods mainly included evaluation of their capstone design presentations and reports, alumni and employer surveys, and confidential senior interviews. For ABEN major, the Fundamentals of Engineering Exam results are also used. At the course level, a variety of assessment methods, ranging from pre- and post-test to rubric development, are adopted by individual instructors.

First of all, we are currently in the process of developing a new assessment plan to ensure our future assessment and report activities will be in compliance with the UAC's new assessment guidelines issued on May 8, 2012.

We also noted the University Assessment Committee (UAC)'s feedback on the department's previous assessment report that the course assessment at the current frequency level had limited our teaching faculty's opportunities to explore additional (or alternative) assessment techniques, to expand the use of repeated observations, and to provide in-depth analysis of and reflection upon the assessment results. As a result, we have reduced the number of the courses to be assessed this year so that the instructors may concentrate on the courses that are being assessed through exploring new assessment techniques, reflecting more deeply on the assessment results, and developing plans to enhance instruction based on results from the previous assessments.

The 2011-2012 assessment report is organized as follows. A draft of the new assessment plan is provided in Section B. Section C discussed the 2011-2012 assessment for ABEN BS program; Section D for ASM BS program; Section E for ABEN graduate program; and Section F provided a summary for the 2011-2012 assessment. The Self-Reporting of Levels of Implementation is also enclosed at the end of this report (see Appendix C).

B. New Assessment Plan (Updated October 2012)

The purpose of developing this new learning outcome assessment plan is to ensure our assessment activities and the resultant report for student learning will be in compliance with the University Assessment Committee (UAC)'s new assessment guidelines issued on May 8, 2012, which are briefly summarized below:

(1) Submit your report only as PDF files;
(2) Limit your report to 5 pages, with no more than 25 pages of evidence as an appendix;
(3) Report on assessment results for only one of the learning outcomes for one of your majors; and
(4) Complete the assessment loop, i.e., last assessment results – changes made – assessment plan for next two years.

Our department has two academic programs – Agricultural and Biosystems Engineering (ABEN) and Agricultural Systems Management (ASM). We volunteer to report one of the learning outcomes for both ABEN and ASM majors every academic year. Since ABEN major is an engineering major accredited by the Accreditation Board for Engineering Technology (ABET), we have purposely chosen an assessment frequency that will be consistent with the six-year review cycle of ABET accreditation.

The plan will be approved by the teaching faculty of the department. Due to unforeseeable changes in the future, the plan shall be revised to reflect the changes whenever it is necessary and the change should be approved by the teaching faculty.

ABEN BS Major Assessment Plan

<u>Learning Outcomes:</u>

The twelve student outcomes for ABEN major defined by ABET are listed as follows:

a. Apply knowledge of mathematics, science, and engineering,
b. Design and conduct experiments, as well as to analyze and interpret data,
c. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
d. An ability to function on multi-disciplinary teams,
e. Identify, formulate, and solve engineering problems, and
f. An understanding of professional and ethical responsibility,
g. An ability to communicate effectively,
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,
i. Recognition of the need for and an ability to engage in lifelong learning, and
j. Knowledge of contemporary issues.
k. Use techniques, skills, and modern engineering tools necessary for engineering practice.

l. Ability to apply engineering skills to agricultural systems,
m. Ability to apply engineering skills to biomaterials systems, and
n. Ability to apply engineering skills to environmental systems.

For UAC assessment reporting purpose, we divide them into three groups of learning outcomes – technical, communicational, and contextual.

(1) Technical learning outcomes include: (a) (b) (c) (e) (k) and (l);

(2) Communicational learning outcomes include: (d) and (g);

(3) Contextual learning outcomes include: (f) (h) (i) and (j)

<u>Assessment Plan:</u>

The following table summarizes the assessment and evaluation activities in a 6-yr cycle for ABEN major.

Year	1	2	3	4	5	6
Course level assessment activities	Technical & Communicational	Technical & Contextual	Technical	Technical & Communicational	Technical & Contextual	Technical
Program level assessment activities	Annually: senior design projects, exit interview, FE exams, transcripts, internship Year 3: graduate and employer surveys			Repeat the activities in Year 1 to Year 3		
Evaluation and UAC report	Communicational	Contextual	Technical	Communicational	Contextual	Technical

First, the assessment activities will occur at the both course and program levels. At the course level, the "added values" in terms of the *technical* learning outcome, that is, how much technical knowledge students have gained by taking the course, will be assessed through quantitative measures such as pre- and post-test. On the other hand, the activities that address the *communicational* and *contextual* learning outcomes will only be documented since the "added values" in terms of communicational and contextual learning outcomes are very difficult to gauge at the individual course level. Therefore, they will be mainly assessed at the program level through conducting the following activities: faculty panel evaluations of written reports for senior design projects, senior exit interview, fundamental exam (FE) results, transcript evaluations, internship performance evaluation, graduate and employer surveys. Except for graduate and employer surveys, which will be conducted in Year 3, all other activities will occur annually.

Second, not every course will be assessed every time it is offered. However, every course will be assessed at least twice in a six year cycle. That's to say, for the courses that are offered every year, they will be assessed at least once in each three year period. For the courses that are offered in alternate years, they will be assessed twice in six years with various frequencies. The assessment scheduling from 2012-2024 for individual courses are further illustrated in Appendix A. The schedule completes a full cycle every 12 academic years. It is worth noting that the number of courses to be assessed is minimized in the spring semester of the ABET accreditation year (i.e., Year 6 and Year 12) so that instructors can focus on preparing for ABET accreditation.

Third, for UAC reporting purpose, assessment results will be evaluated for one learning outcome each year. In other words, the assessment results pertaining to *communicational* learning outcome will be synthesized in Year 1 and be reported to UAC; those for *contextual* learning outcome will be synthesized in Year 2 and be reported to UAC; and those for *technical* learning outcome will be synthesized in Year 3 and be reported to UAC.

Fourth, each of the ABET student outcomes will be assessed by at most three courses using rigorous quantitative measures.

Fifth, an assessment report template has been developed for instructors to use when reporting their assessment activities for individual courses (see Appendix B).

ASM BS Major Assessment

Learning Outcomes:

Three (3) learning outcomes for ASM major are defined as follows:

(1) Management outcome – graduates will be able to analyze and plan the function, application, and management of equipment, facilities, systems or processes related to agribusiness.

(2) Analytical outcome – graduates will be able to use computational techniques and computational aids in solving technical problems related to agribusiness and to appropriately integrate disciplinary ASM knowledge, agricultural/biological sciences, and business/economic principles in problem solving activities.

(3) Professional outcome – graduates will have communications skills, professionalism, and recognition of lifelong learning.

Assessment Plan:

The following table summarizes the assessment and evaluation activities in a 6-yr cycle for ASM major.

Year	1	2	3	4	5	6
Course level assessment activities	Management	Analytical	Professional	Management	Analytical	Professional
Program level assessment activities	**S**enior design projects, exit interview, transcripts, internship will be assessed annually			Repeat the activities in Year 1 to Year 3		
Evaluation and UAC report	Management	Analytical	Professional	Management	Analytical	Professional

C. ABEN BS Program Assessment

1. ABEN BS program student outcomes

The 2011-2012 ABEN program assessment activities were focused on the ABEN program educational objectives and student outcomes that also reflect ABET EC-2012 criteria for engineering program accreditation. These criteria have also guided the faculty in their definition and selection of methods and processes for learning outcomes assessment. The following summary of assessment results for 2011-2012 is based on the continuation of processes begun in '99-'00.

The ABEN program educational objectives and student outcomes are:

<u>Educational Program Objective 1.</u> Graduates will become engineers with the ability to use their technical knowledge, design, and problem solving skills throughout their careers. This objective addresses the following learning outcomes:

- ABET-a Apply knowledge of mathematics, science and engineering
- ABET-b Design and conduct experiments, as well as to analyze and interpret data
- ABET-c Design a system, component, or process to meet desired needs
- ABET-e Identify, formulate, and solve engineering problems
- ABET-k Use techniques, skills, and modern engineering tools necessary for engineering practice

<u>Educational Program Objective 2.</u> Graduates will become engineers who have interpersonal and collaborative skills and the capacity for productive careers. This objective addresses the following learning outcomes:

- ABET-d An ability to function on multi-disciplinary teams
- ABET-f An understanding of professional and ethical responsibility
- ABET-g An ability to communicate effectively
- ABET-h The broad education necessary to understand the impact of engineering solutions in the global and societal context
- ABET-i Recognition of the need for and an ability to engage in lifelong learning
- ABET-j Knowledge of contemporary issues

Educational Program Objective 3. Graduates will become engineers who can use their disciplinary knowledge and educational depth and breadth to deal with changing career opportunities in agricultural and closely related biological industries. This objective addresses the following learning outcomes:

ABEN-l (i)	Ability to apply engineering skills to agricultural systems
ABEN-l (ii)	Ability to apply engineering skills to biomaterials systems
ABEN-l (iii)	Ability to apply engineering skills to environmental systems

2. Program-level assessment results

2.1 Capstone senior design

Student performance in the major design experience of the curriculum—capstone design courses—is the primary measure of attainment of student outcomes. The topic areas of the five projects in 2011-2012 may be categorized into machine systems, process or biosystems engineering, and soil and water engineering. Formal oral presentations are made by capstone design teams at the conclusion of their design projects and students summarize their engineering designs in written project reports. A selected subset of the reports is evaluated by a review team of ABEN faculty members (Drs. Wiesenborn, Pryor, and Steele) with the use of a senior design project evaluation rubric. The rubric assesses achievement of the program's student outcomes (Figure C-1).

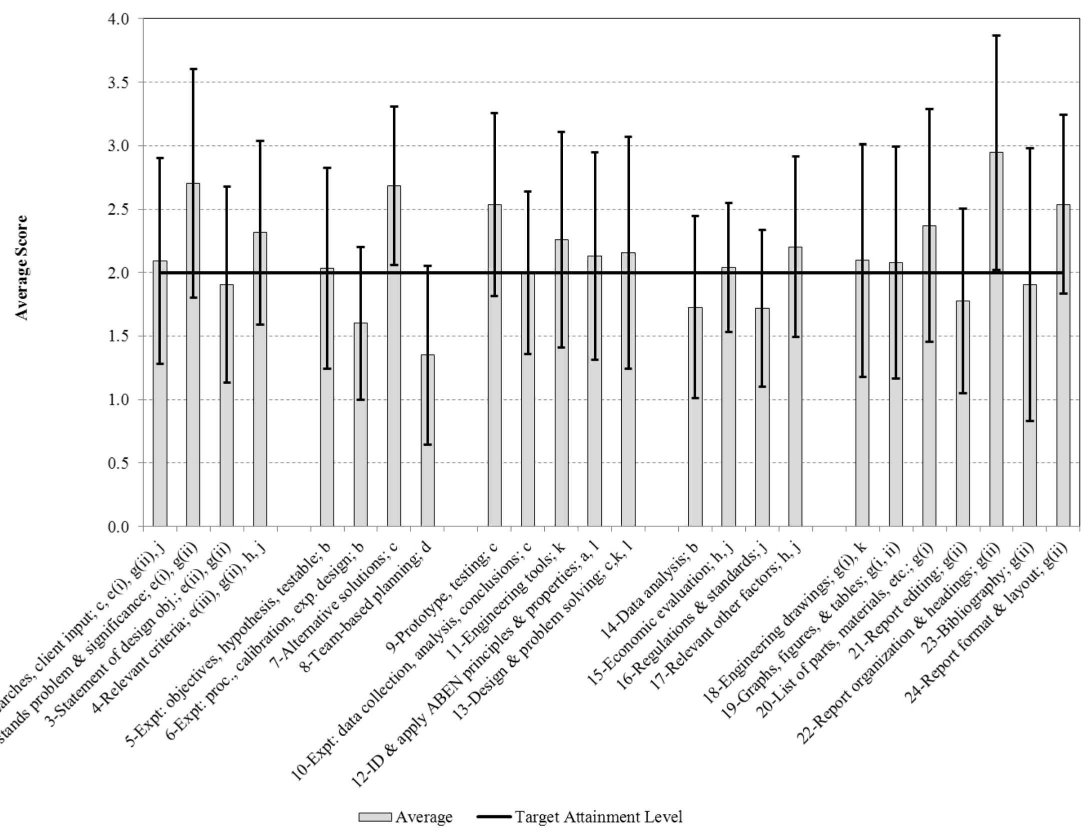

Figure C-1. Average +/- one standard deviation of rubric scores on senior capstone projects vs. ABEN student outcomes.

2.2 Alumni and employer survey

Surveys of alumni and employers have been primary tools used to assess graduates' attainment of ABEN program educational objectives. In December, 2011, 57 survey questionnaires were sent to our alumni with 3 to 5 years of experience and their employers. Twelve (12) alumni and 7 employers responded. Table C-1 summarizes the alumni and employer survey responses to three questions assessing alumni capabilities.

Table C-1. Summary of 2011 alumni and employer survey responses.

Survey Question	Alumni Average[1]	Employer Average
How well did the ABEN program prepare you (its graduates[2]) for designing systems, components, or processes?	4.3	4.3
How well did the ABEN program prepare you (its graduates) to communicate effectively in your current job?	4.3	3.9
How well did the ABEN program develop your (its graduates') engineering skills so that you (they) could apply them to agricultural, biomaterials, and/or environmental systems?	4.3	4.4

[1] Rating scale: 5=Excellent, 4=Good, 3=Adequate, 2=Fair, 1=Poor, NA=Not Applicable.
[2] Parenthetical phrases represent the slightly-revised wording in the employer surveys.

2.3 Senior exit interview

Students in the ABEN program are asked to participate in an exit interview with the Department Chair and complete a survey immediately prior to their graduation, regardless of semester. The exit survey encompasses a wide variety of questions and addresses all of the ABEN student outcomes. Sixteen (16) out of 27 students who graduated in 2011-2012 participated in exit interview. Although they are generally satisfied with the program's preparation of students for engineering work, some of them suggest some lab facilities and equipment are out of date. Almost every interviewee suggests get an internship.

2.4 Graduate job placement

Placement of graduates of the ABEN program continues to be 100%. Starting salaries range from $40,000 to $72,200 with the average being $63,389. Nearly all students have multiple excellent job offers. Local, regional, and national companies continue to hire ABEN graduates. Nearly all ABEN students participate in one or more cooperative education experiences.

2.5 Fundamentals of Engineering exam

Testing of student ability in basic and engineering sciences is a major aspect of the Fundamentals of Engineering Exam (FE). Therefore, the department is using the FE exam data as an assessment tool. The target attainment level is that, for those students taking the FE exam, the department's students should perform at the level of their national ABEN peers in subject matter scores and in passing rates of the FE exam. There were 4 ABEN graduates taking the FE exams in October 2011 and April 2012. All of them have passed the exam (i.e., passing rate is 100%). The national passing rates for October 2011 and April 2012 exams are 75% and 88%, respectively.

3. Course-level assessment results

The courses that were assessed during 2011-2012 are listed below. Following the list are the individual assessment reports provided by the faculty in which the individual faculty member discusses objectives, assessment method, assessment results, and their future plans in response to the assessment results in detail.

ABEN 110: Introduction to Agricultural and Biosystems Engineering (Pryor)
ABEN 358: Electrical Energy Applications in Agriculture (Bon)
ABEN 377: Numerical Modeling in Agricultural and Biosystems Engineering (Lin)

ABEN 110 – Introduction to Agricultural and Biosystems Engineering (Pryor)

Assessment Objectives: By the end of the course, students should be able to:

1. Explain the basic sub-disciplines of Agricultural and Biosystems Engineering (ABET j).
2. Demonstrate a proper approach for engineering problem solving (ABET e and g).
3. Identify and solve basic and practical problems related to Agricultural and Biosystems Engineering (ABET a, e).

Additional course goals include:

1. To develop students' understanding of the need for clear technical communication in engineering. (ABET g)
2. To encourage students in the process of academic and career goal development (ABET h and j)
3. To encourage an understanding of professional and ethical responsibility. (ABET f)

Assessment Methods: Assessment of student learning was monitored via several formal and informal mechanisms:

- An 18-question pre-test was given as the first HW assignment. The test was grade on participation only. It included basic True/False and multiple choice questions as well as some open-ended questions. "I don't know" was given as an option for all multiple choice questions to prevent guessing correctly. Several questions from the pre-test were given again as a quiz or exam question in the same format. Most of these follow-up questions were more difficult because they were open-ended (not MC or T/F) or embedded in more complex problems.
- Students were given low-tech PRS systems which consisted of a standard piece of paper divided into 4 quadrants with a different color and letter for each quandrant (e.g. Red/A, Blue/B, etc). Papers were folded so a student could easily show one color indicating her or his answer to a class question. This system was used periodically throughout the semester depending on the topic.

- Mid-semester and end-of semester course evaluations were given.
- 9 HW assignments were given throughout the semester.
- 1 final exam, 2 midterm exams, and 5 quizzes were given over the semester. Data from all exams was collected showing the topic for each question and the percentage of students earning at least 75% of the points for the question (for questions where partial credit is given).
- Students were given 5 bonus points on the final exam to explain why they did not seek help in completing HW problems (if that was the case) and what was the primary hindrance in doing as well as they could have.

Assessment Results: Selected pre-test questions were asked again later in the semester in either the same or a somewhat more challenging format. Comparison of results are shown in Figure 1. Clearly, large improvements were made in all areas, but a significant percentage of students still could not demonstrate that they had learned the concepts adequately. Average scores for most were in the 70%-80% range. Surprisingly, questions related to levers, gears, and hydraulics had the lowest scores while a majority of students have a strong interest in mechanical systems. These problems were arguably the most challenging, however.

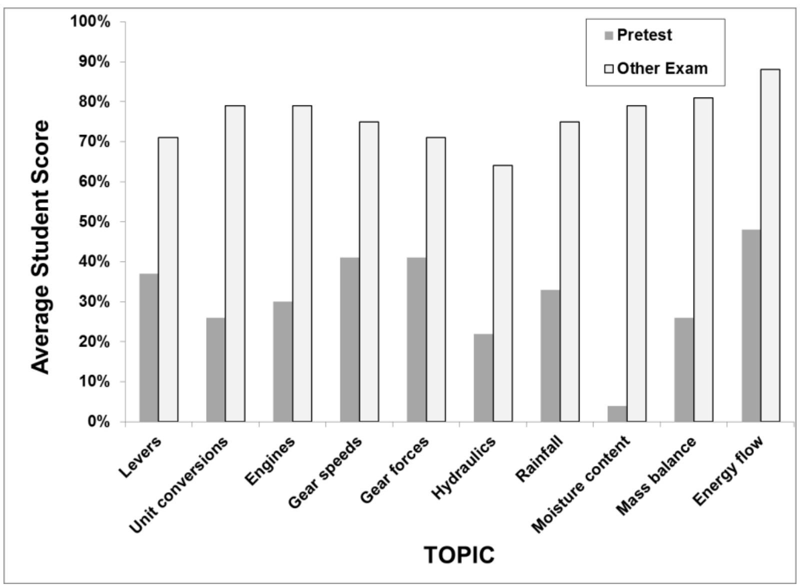

Figure 1. Select pre-test questions with exact or similar questions asked on follow-up exams during the semester.

Figures 2-4 show questions topics for each exam and the student success measured as the average percentage of points received for each question and the percent of students who received at least 75% of the total points for the question. Unit conversions and levers and engine problem were the most challenging for students. Unit conversions are mostly problematic because students have poor algebra skills. It is a topic that is embedded in most or all other topics and one which is emphasized throughout the semester. A marked improvement was seen between Exam 1 and the Final Exam.

Most mistakes related to levers are due to inability to correctly identify applied and resultant lever arms. Many students want to simply take a number that they see in a problem and stick it into an equation without fully understanding what the equation term is. Problems with this "plug and chug" method of problem-solving are repeatedly emphasized. In addition to standard practice problems, students could be asked to define these terms in a HW and to think of several examples of each class of lever and draw them, identifying the each leaver arm in the diagram.

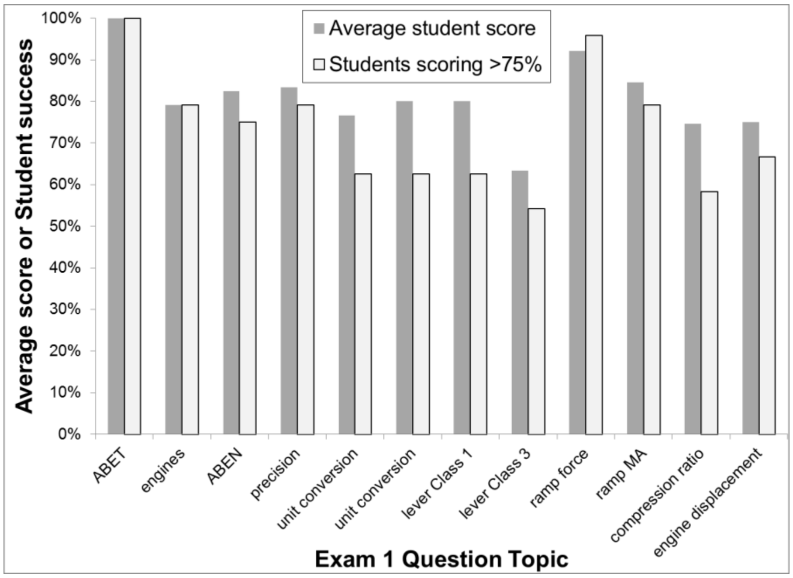

Figure 2(a). Student success for topics on the first exam.

Dangers of "plug and chug" continued to be problematic with problems related to gears and pulleys (forces, speeds, and torques). This topic was presented as a problem first and we worked through the problem based on what we had already learned about levers. The information we deduced was reinforced in a subsequent lecture, and students were given a list of the rules or equations and the situations in which they could be used. Students need more practice with these problems but lack of seriousness about preparation also plays a role for a significant number of students.

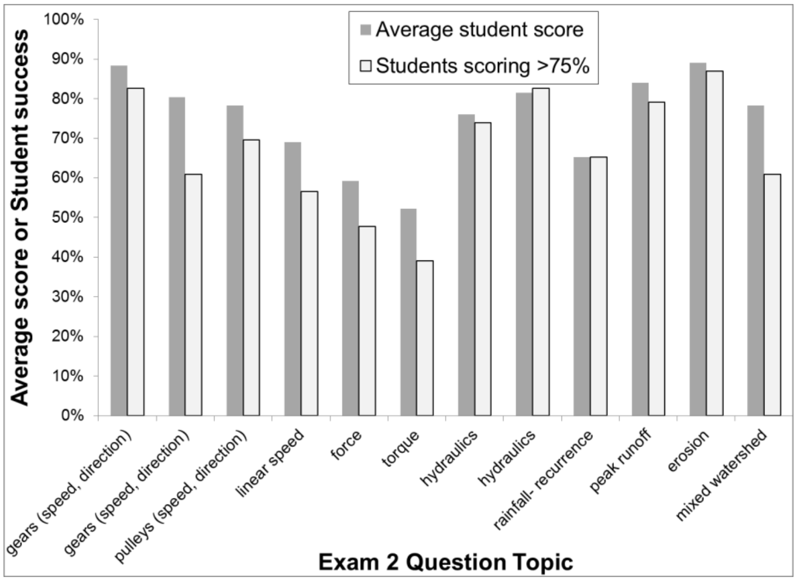

Figure 2(b). Student success for topics on the second exam.

Students did not do as well on the final exam as I would hope or expect. Overall half of the class scored above 80% and a quarter scored above 90% indicating that the exam was fair and not too challenging. Many students who I felt should have done better scored in the 50%-69% range. Several others scored lower than that but these students frequently missed class and did not put effort into completing HW assignments. Problems with the final were similar to what I saw in the first exams – students did not think clearly about the problem and tried to plug numbers into equations without thinking about what the equation terms meant. Students were allowed to bring an equation sheet into the exam which may lead to a false sense of security. They feel that having the right equation is enough to solve a problem. If pressed, they would acknowledge that this is not true but I believe that practically they think they have used it before and so must know it already.

Many students also did poorly on the bioenergy related questions. This lecture occurred before Thanksgiving when many students were absent. There was no reading on the topic and so they only had the skeleton powerpoint notes to work from.

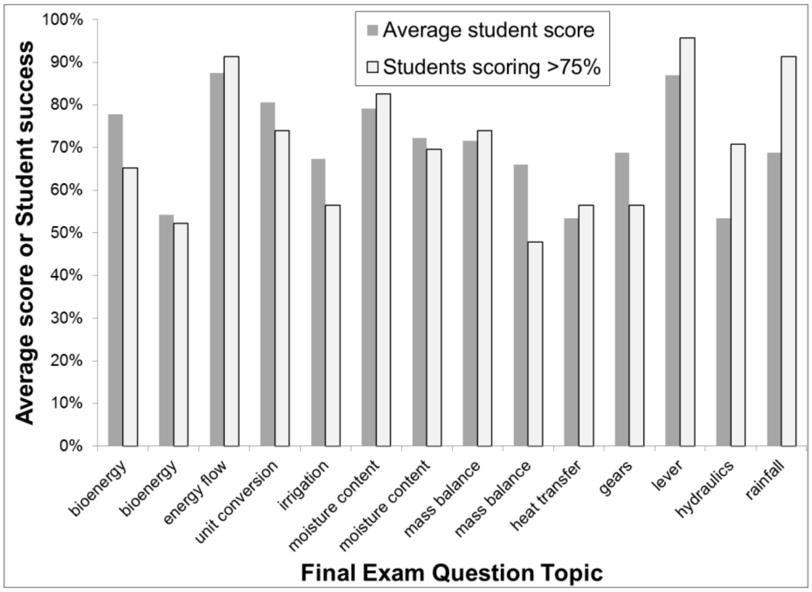

Figure 3. Student success for topics on the final exam.

When asked what prevented them from doing as well as they could have in the course, the responses were:

- I don't think I put enough priority on this class. I should have spent more time on it. Other than that I just had a hard time finishing the exam.
- I didn't come ask for help.
- Lack of ambition sometimes and again time constraints again.
- What prevented me the most is that I had a hard time with the math, and getting my brain to think like an engineer/math person brain again, since I haven't took math since my freshmen year. The other thing that prevented me from doing well in this class was this class required a fair amount of time and this semester I just didn't have the time to do well in a class like this. [Note: non-science/engineering student]
- Two big things that prevented me from doing the best are procrastination and time.
- I don't think anything really prevented me from doing well.
- Most significant one was language for me. Just solving problem was not hard. When I have a problem that I can't solve, I needed description. But I couldn't understand even the description. [Note: exchange student from Korea]
- Did not have the "proper solving format". I did not feel that it was necessary when I did not use it because it was simple math.
- I think what prevented other people from doing well was following the homework guidelines. Those were easy points. They could get a decent amount of points even if the answer is not correct.
- Not giving 100% of my effort.
- Forgetting to turn homework in.
- Class attendance was the key to any downfall I had in this class.
- Missed a quiz and a homework.
- Mostly me not seeking help and not going over the material a lot.
- I think the only thing that "kind of" prevented me from doing my best was the book. I did not find it very helpful, and often times it seemed like it didn't have as many complex problem examples, like the ones we were doing in class.

- Time management and harder studying.
- Lack of time and effort would be the main reason.
- I think focusing too much on my other rigorous classes prevented me from doing as well as I could in this class. If I would have put as much time in this class as I do for chem and biology I would have had no problems.

Students were generally satisfied with how the class was taught as seen in results from a mid-semester survey.

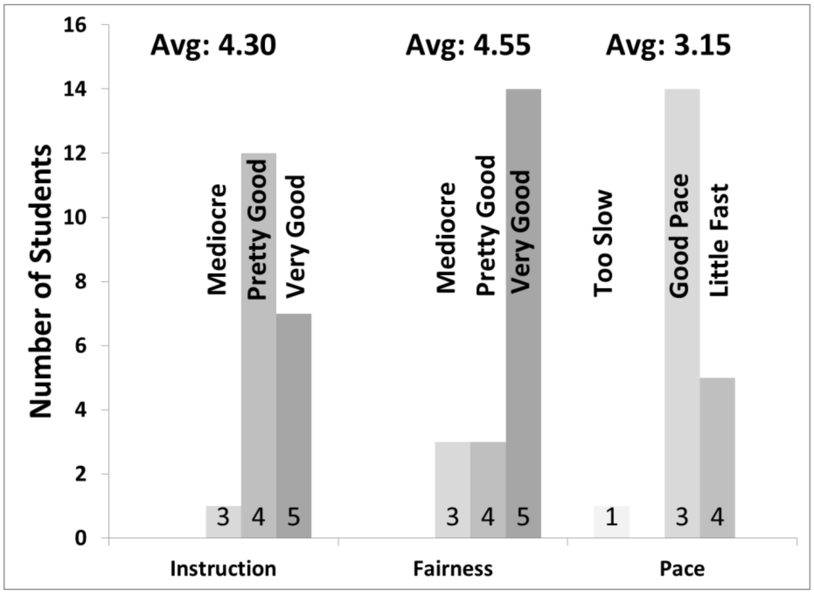

Figure 4. Midterm evaluation results

Response to Results: At least half of the students in class demonstrated that they had a solid understanding of course material and could solve problems in an organized methodical framework. Another segment of the class did not. The biggest area for improvement for students having problems in the class is the ability to break a problem down, identify the key information, and relate it to principles and equations discussed in class. As suggested earlier, a stronger emphasis on definitions of all equation terms may help with this. I feel students learn best when working on problems themselves and that is why 25% of the course grade was HW. I also repeatedly invited students to come in to see me for help and students identified during surveys and evaluations that I emphasized and welcomed seeking help more than any of their other instructors. I don't feel that much can be changed in that regard, but I will continue to point out the importance of practice and the availability of help.

The use of PRS-type questions in class was quite successful and should be expanded in the future. Students were asked to respond to a question and if many students did not have the correct answer, I would ask them to discuss with a neighbor to try to convince each other of their logic. After 1-2 rounds of this, the class was typically unanimously in support of the correct answer. When this was done, it worked very well. The challenge will be to expand and develop new questions for all course topics.

ABEN 358 – Electrical Energy Applications in Agriculture

Considering at the changes in reporting outcome assessment in classes, a key idea is to select an area or topic to concentrate on and seek to assess student learning in that area. Two basic, but important areas in ABEN 358 are:

- A) Understanding and using the basic electric voltage and current diagram in series and parallel circuits, especially with respect to electrical power factor; and
- B) Understanding color coding in electrical wiring.

Results on the pre-test given at the start of the course indicated not just a lack of understanding, but actually significant misunderstanding on these topics. True and false questions were asked on the pretest. If about 50% of the students got the question correct and about 50% got it wrong this indicates the class is guessing at the answer. The closer the student response come to 100% on the question, the greater the indicated understanding or background of the class. The class response on the pretest was:

- For A, question 3 on the pretest, 18.2% of the students got this question correct indicating misunderstanding about current and voltage; and
- For B, questions 6 and 10 on the pretest, 36.4 % and 63.6% of the students responded correctly respectively, indicating guessing on this material.

Exam one addressed the items in A on questions 3, 15 and 16 addressed portions of the topic in greater detail. Question 3 was gotten correct by 100% of the class and dealt with principles. Questions 15 and 16 were mathematically based voltage and current relationship problems. The average rating of student performance on these problems was 3.4 and 3.3 respectively on a 0 to 5 scale. A 0 indicates the student left the problem blank, and a 5 indicates the work had no errors or deficiencies. A 4.0 or better rating is the desired rating to indicate very good student understanding. The results indicated an above average level of performance but not the desired level of understanding the instructor wants.

Student understanding of part B was tested in question 21 of exam 2. Here the average evaluation of the class performance was 4.4 on the 0 – 5.0. This indicated students had learned the color coding of electrical wiring to a satisfactory competency level.

In conclusion, this course is only offered once every two year. I was satisfied with the student performance level in the color coding of electrical wiring, but the evidence indicates more work needs to be done on the current and voltage diagram. To address this issue when the class is again offered in the fall semester of 2013, I plan to incorporate two more example problems in the course and increase the work done in the laboratory exercise on this topic. I then plan to include these two items and two others to be determined later in the outcome assessment of the course the next time it is offered.

ABEN 377 – Numerical Modeling in Agricultural and Biosystems Engineering (Lin)

Learning Objectives: The learning objectives of Numerical Modeling in Agricultural and Biosystems Engineering include:

(1) Understand the fundamental concepts of finite element analysis (FEA) methods;
(2) Apply the finite element methods to solve engineering problems involving stress analysis, heat transfer, and fluid flow;
(3) Use general-purpose finite element software such as ANSYS to obtain solutions to engineering problems in agricultural, biomaterial and environmental systems.

Assessment Methods: Four different methods were used to assess the effectiveness of learning/teaching activities with respect to attaining the above-mentioned learning objectives. First, volunteers or specific students were invited to come in front of class to make in-class calculation on whiteboard after examples on certain subjects were given. Others were invited to comment on the student's work afterward.

Second, ten short quizzes were given out regularly throughout the semester to find out whether the students were able to understand the basic concepts of the FEA methods and apply them to solving engineering problems. The quiz question(s) would be graded overnight and would be analyzed in the following lecture if a common mistake was made by more than a couple of students. Students were also occasionally asked to summarize the course materials covered in the previous lectures in one sentence.

Third, a midterm survey was given to the class through a third party on campus. The service was provided by the university free of charge. Student rating of instruction (SROI) was also used to assess the instruction of this course. Both midterm survey and SROI are particularly useful in obtaining suggestions for improvement of instruction and collecting feedback on the text, software and appropriate course topics, etc. Nineteen students were enrolled in this class. One dropped out of the class in the middle of the semester. Eleven of them responded to the midterm survey while 16 of them responded to SROI in the end of the semester.

Fourth, a formal pre-test/post-test technique was also adopted to measure the "course value" added to the students' knowledge of the subject after taking this course. A pre-test was scheduled in the first week of the semester. In the end of semester, almost all problems appeared in the pre-test was incorporated into the final exam in the same or similar form. The assessment problem set included 10 multiple choices questions and 2 application questions. Two multiple choices questions were embedded in the pre-test to test students' prerequisite knowledge before taking this course. Eight multiple choice questions were intended to test the accomplishment of Objective 1 whereas the application questions were designed for Objective 2. Only one student has seen his friends using ANSYS software before he took this course; none of the other students has been exposed to the software. Therefore, the attainment of Objective 3 is assumed if the students are able to perform well in ANSYS lab assignments.

Assessment Results: Assessment results from quizzes and in-class exercises would be addressed immediately throughout the semester. One consistent comment resulting from the mid-term survey was that the students need more instruction and help for ANSYS exercises. As a result,

five ANSYS demonstration lab sessions were scheduled and more than 60 pages of computer lab notes were developed and handed out to students. The computer cluster room is only equipped with 12 computers with ANSYS software installed. The instructor raised the issue at the departmental faculty meeting and a new computer lab with 24 computers was constructed for instructional purpose. This course will be able to use this new lab in the spring of 2013.
The results for pre- and post-test are summarized in Table 1. Seventeen students took both the pre-test and the final exam (post-test). The scores for 5 ANSYS labs are also included in the table.

Table 1. Percentage of the correctly answered questions in pre-test and post-test (%).

Objectives	Pre-test		Post-test	
	Individual students	Class average	Individual students	Class average
Prerequisite knowledge	50-100	70.6	0-100	52.9
Objective #1 (Multiple Choices)	12.5-50	34.6	37.5-100	79.4
Objective #2 (Applications)	0-0	0	50-100	87.2
Objective #3 (ANSYS labs)	––	––	81-96	88.3

Table 1 shows that the average attainment rates for the three course learning objectives are 79.4%, 87.2% and 88.3%, respectively. However, the knowledge retention rate for the prerequisite knowledge decreased from 70% to 53% after one semester. It should be noted that there were only two multiple choices questions for testing the students' prerequisite knowledge. So this may not reflect the overall picture. Another thing worth pointing out is that the students receiving better grades in multiple choices tend receive relatively worse grades in computer labs.

Response to Results: I will continue asking individual students (ideally volunteers) to come to the white board to help solve part of examples or small questions. This method can also serve as a learning assessment method supplemental to quizzes which usually take a longer turn-around time.

(1) Difficulties with ANSYS software came up frequently in SROI comments. With a new and better equipped computer lab, I shall be able to improve lab instructions and develop more lab notes for students.
(2) Improve student's written communication skills, I will develop templates for lab and project reports.

D. ASM BS Program Assessment

1. ASM BS program student outcomes

The assessment activities in 2011-2012 were made relative to the four student outcomes that have been assessed since '92-'93.

Student Outcome #1 – Graduates will be able to analyze and plan the function, application, and management of equipment, facilities, systems or processes related to agribusiness.

Student Outcome #2 – Graduates will be able to use computational techniques and computational aids in solving technical problems related to agribusiness and to appropriately integrate disciplinary ASM knowledge, agricultural/biological sciences, and business/economic principles in problem solving activities.

Student Outcome #3 – Graduates will be able to express themselves with oral and written communications skills.

Student Outcome #4 – Graduates will value their professionalism and the need and importance of lifelong learning.

2. Program-level assessment results

2.1 Capstone projects

ASM capstone is quite different from ABEN. The name of the Capstone course is "ASM475 Management of Agricultural Systems". Students engage in capstone learning experience involving team solution to problems in agricultural systems management. The students gain experience in applying what has been learned in other ASM classes in working as part of a team to solve a real-life problem. They also gain experience in oral and written technical communications and interact with professionals in the field of agriculture. Solutions of the problem result in a final oral and written report of professional quality. The topic areas of the seven projects in 2011-2012 may be categorized into machine systems, farming systems, agribusiness, crop diversity and climate change. Formal oral presentations are made by capstone teams at the beginning of the semester as project proposal and at the conclusion of their projects as final report.

2.2 Senior exit interview

Students in the ABEN program are asked to participate in an exit interview with the Department Chair and complete a survey immediately prior to their graduation, regardless of semester. The exit survey encompasses a wide variety of questions and addresses all of the ABEN student outcomes. Ten (10) out of 28 students who graduated in 2011-2012 participated in exit interview and all agreed that they are satisfied with the program's preparation of students for management work. Graduating seniors continue to comment on the relevance of the program to their intended career paths. They feel the courses are "relevant to real-life." Students like the broad spectrum of classes and the flexibility the program provides.

2.3 Graduate placement

Placement of ASM graduates continues to be excellent. The average starting salary of those reporting was $37,610 with a range of $30,000 to $40,000. Often these salaries are further enhanced by commissions on product sales. Local, regional, and national companies hired ASM graduates. Excellent placement indicates the confidence employers have in ASM graduates and the education they receive through the ASM program.

3. Course-level assessment results

The courses that were assessed during 2011-2012 are listed below. Following the list are the individual assessment reports provided by the faculty in which the individual faculty member discusses objectives, assessment method, assessment results, and their future plan in response to the assessment results in detail.

ASM 354: Electricity and Electronic Applications (Solseng)
ASM 264: Natural Resource Management Systems (Jia)
ASM 429: Hydraulic Power Principles and Applications (Solseng)

ASM 354 – Electricity and Electronic Applications (Solseng)

Assessment Objective 1: Assess the ability of students to recognize and use electrical symbols.

Assessment Method: In the first lab for the class, I had each student draw a simple circuit. In future labs, using symbols and drawing circuit were part of the lab. Also, each test included a circuit and or a question involving the correct symbol and in class the students were asked to use the symbols or try to draw the symbols on the white board.

Assessment Results: The percent of symbols used correctly by the end of the class was 100% (recognition and use of), 95% for complete circuits (up from previously), and 90% the total diagram (up from previous years), including correct symbols properly placed and the circuit completed correctly. The diagram was probably up because in lab I had them do more diagrams and was more critical of errors. I also drew more schematics in class and had more in the homework.

Response to Results: Continue to emphasize the importance on symbols and drawing and reading circuits. Because the first drawing at the beginning of the semester was not standardized students saw need for following some type of structured form and quickly picked up on the use of symbols for electrical components The use of more diagrams and more individualized stress in class and lab helps the students understand the importance for the use of proper symbols and completeness of diagrams.

Assessment Objective 2: Assess the ability of students to perform basic wiring skills.

Assessment Method: In the lab, the students were to wire a basic circuit given an outcome and were told to follow National Electric Codes. This lab was then repeated in three weeks with a slightly different and more difficult circuit.

Assessment Results: The first lab raised a lot of questions which were answered through the use of NEC. Then in the second time though the students knew most of the codes and spent a lot less time before asking and looking for the codes. The students also understood what the electrical terms meant, how important a diagram was, and how to test for problems and correct them.

Response to Results: Continue to emphasize the importance of proper wiring practices and NEC. Found that some of the students did not understand how to use the Volt-Ohm meter. Necessitating a lab or part of a lab to make sure the students understand the scales and how the tester can aid in test for problems.

Assessment objective 3: Assess the knowledge of students entering and exiting course.

Assessment Method: Used a pre/post test to evaluate the base level of the students in several areas. The questions were then put in the hourly exams as the material was covered then the scores were added at the end of the semester.

Assessment Result: The average score on the pre-test 32.8% (range of 12-54%) of the questions answered correctly. The post-test average went up to 81% (range of 62-98%). The average increase from the pre to post test is 181% with a range of 48% to 667%. Over 1/3 of the class scored 90% or better and only 18% scoring in the 60-70% this is much better than in the past.

Table 1. Results of pre and post test with calculated averages 2011

Student	Pre test	Post test	Difference	Percentages
1	40	90	50	125%
2	52	96	44	85%
3	12	92	80	667%
4	24	64	40	167%
5	28	70	42	150%
6	16	62	46	288%
7	32	84	52	163%
8	28	86	58	207%
9	32	76	44	138%
10	54	80	26	48%
11	36	96	60	167%
12	40	98	58	145%
13	36	74	38	106%
14	40	74	34	85%
15	20	66	46	230%
16	40	78	38	95%
17	28	90	62	221%
Average	32.8	81	48.2	
	average increase in scores			181%

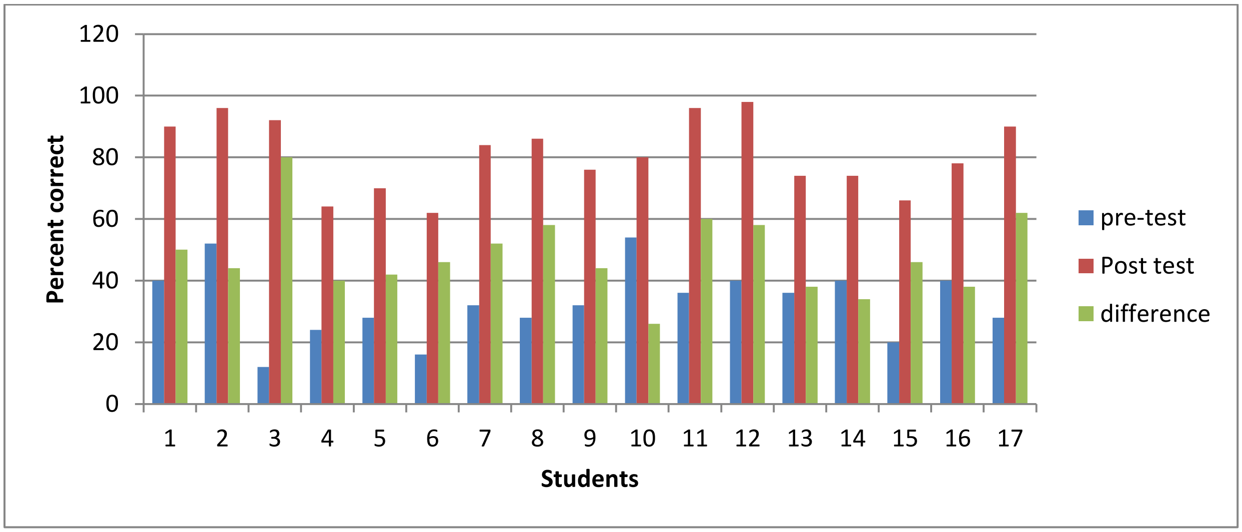

Figure 1. Percent per and post test scores for studentsASM 354 fall 2011

<u>Response to Results:</u> Continue to use pre-post- test as a method of determining the level the students enter the course and see how level changes. As the questions were completed on the hourly tests I then can cover the needed material again so the students who had trouble would get the material. If there was material that was a problem that was a post-test question that a larger percent of the students got wrong, after covering it again I put it on the next test. Test result was 100% got it right, this was not used in calculating the percentage for post-test scores.

Assessment Objective 4: Determine the students could use test equipment, VOM.

Assessment Method: Started lab with explanation of use early in semester. Then observed and asked students to demonstrate use later in semester.

Assessment Results: One student out 17 had problems using the VOM after the first lab where they were used. By the end of the semester he still had some problems but understood the basic use.

Response to Results: Will continue to stress and check usage in practical applications. I am considering adding a lab that deals specifically with this problem.

Assessment objective 5: Determine the students comfort zone with electricity.

Assessment Method: Wiring lab was used to see if students understood basic safety and would work with electrical devices.

Assessment Results: In the last lab all the students were checking power and were comfortable working on electrical circuits.

Response to Results: Will continue to stress because one of the first problems is they are confused and scared of electricity. Getting over the mystery and fear is a large part of working with electricity.

ASM 264 – Natural Resource Management Systems (Jia)

Learning Objectives: (1) To study basic surveying methods and their application to field problems; (2) To learn management and design of soil and water conservation principles and practices; and (3) To appreciate challenges and responsibilities associated with managing soil and water systems.

Assessment Methods: This class contains two lectures and one lab each week. A student survey was conducted anonymously during the first lab with a set of questions. Students' understanding and expectation about the course, career goals, and hometown were grouped into several categories and posted on the Blackboard. During the entire semester, their course expectations and career goals were repeatedly brought out to remind the students that the contents were appropriate for the course and could prepare the students for their future job. This remind was critical to the success of the course because in this class, students from three major disciples, ASM, NRM and SOIL, have different career expectations, and showed different personal opinions on soil and water management. Through this course, they have a better understanding on the different challenges and responsibilities associated with soil and water systems for the three groups of people in the future. Guest lecturers from government, industry, and academic were invited to cover special topics. Quizzes, lab reports, and four mid-term exams were used to assess the student's learning ability. Their satisfaction and comment about the course were surveyed after the mid-term exams.

Assessment Results: Students showed a high interest on most of the topics and appreciated the difference among students' background and expectations. Most of the students (2/3) obtained good scores on their lab, homework and quiz. Consequently, the exam scores were also higher for those who did well on the assignments and attended the class regularly. An online assessment assignment was given in the middle of the semester.

Response to Results: Although the prerequisite of the course is at least college algebra, some students lacked a minimal background on basic algebra to accomplish their assignments. In addition, some students were afraid of any math. The instructor has to repeat some key concepts and calculation procedures for these students. Students showed good satisfaction about the course (4/5) during the mid-term course evaluation.

ASM 429 – Hydraulic Power Principles and Applications (Solseng)

Assessment Objective 1: Assess the increase in general knowledge of the students in hydraulics concepts and problems solving skills.

Assessment Method: A 25 question pre-test was given at the beginning of the semester. During the semester similar questions were included on the exams and the scores were recorded and compiled at the end of the semester. Performance allows one to pinpoint particular trouble areas for student learning.

Assessment Results: The percentage of correct answers on the pretest ranged from 20 to 55% with an average of 37.9%, with several students scoring above 40%. This is unusual in past years very few students scored above 40 % and most scored below 20%. The scores for the post-test ranged 77 to 100% with an average of 88.8%., with 2 students scoring below 80% and 10 scoring above 90%. The ratio increase in scores ranged 24 to 75 from pre to post test, the average percent increase was 153% or 1.5 times the starting score.

Table 2. Pre/post test scores ASM 429 sections 1 and 2 spring 2012

student	pre-test	post test	difference	percent increase	
1	20	80	60	300%	
2	30	85	55	183%	
3	20	81	61	305%	
4	25	92	67	268%	
5	45	92	47	104%	
6	45	97	52	116%	
7	40	86	46	115%	
8	45	86	41	91%	
9	35	90	55	157%	
10	35	90	55	157%	
11	45	90	45	100%	
12	45	95	50	111%	
13	25	100	75	300%	
14	40	86	46	115%	
15	35	81	46	131%	
16	55	79	24	44%	
17	50	100	50	100%	
18	45	100	55	122%	
19	40	77	37	93%	
average	37.9	88.8			
	Average increase in score			153%	

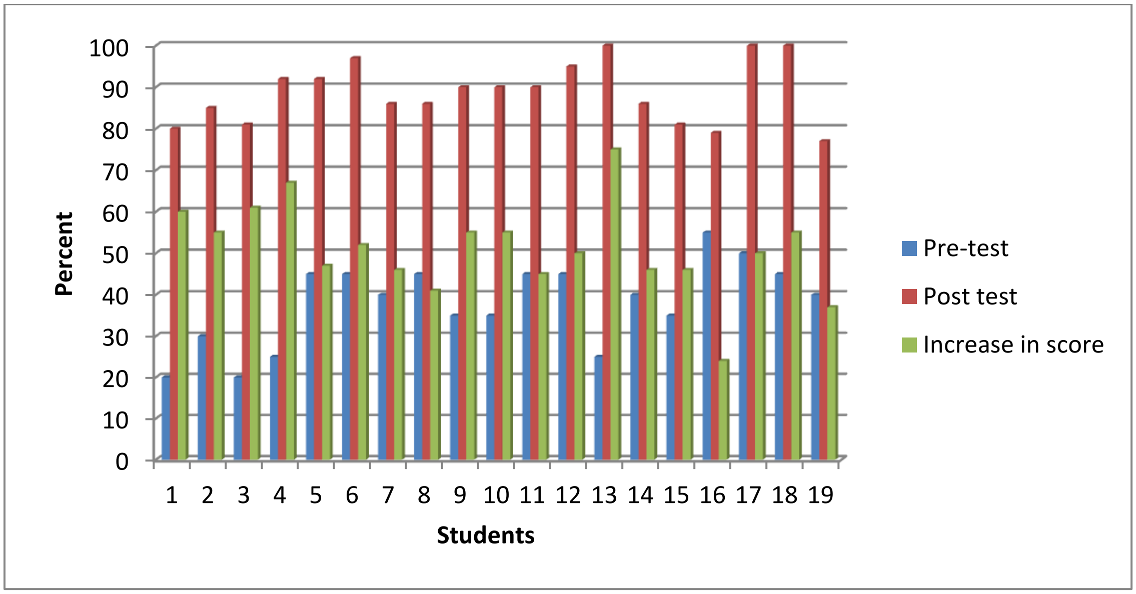

Figure 2. Pre/post test data ASM 429 Spring 2012 sections 1 and 2.

Response to Results: The students came in with more knowledge on the topic which made the class go faster. I did not have to spend as much time on some basic topics and spent more time on some more difficult topics. Also I was able to ask questions and get quicker responses, which moved things faster.

Assessment Objective 2: Assess students' ability to recognize commonly used hydraulic symbols and relate them to physical parts.

Assessment Method: At the beginning of the semester students were given hydraulic parts and symbols and asked to make educated guesses as to what they were. Mid-semester individuals were given a hydraulic diagram and parts which were on the diagram then matched part numbers with symbol numbers.

Assessment Results: At the beginning of the semester most students were able to identify greater than 45 % of the parts and symbols (72%) There were two students that had little or no idea what the parts could be. At the mid semester point, 17 out of 19 got 100% with 2 scoring 85%.

Response to Results: I thought the students would have more problems identifying the parts however because they came in with more knowledge they did much better. Also in between the first and second we studied some similar parts making it easier. This is an important concept to understand as locating and identifying parts can greatly increase productivity.

Assessment Objective 3: Assess student's abilities in understanding and putting together a complete hydraulic system using parts and schematic symbols.

Assessment Method: Early in the semester the class had a lab project which required a diagram of a system, as a group I allowed them to make decisions as to what was needed. Later in the semester they individually did the same type system layout and we followed a system on a piece of equipment locating parts. Then on the final I had a problem where they were to draw a schematic of a system which was laid out in pictorial fashion.

Assessment Results: The first project as a group they were able to determine what parts were needed but had problems with what the symbols. The order and where the connections were made seemed to confuse some students. The second project was more complex but the students were more confident and by helping each other and discussing the system they did fine. The problem on the final test had 1 people scoring below 50% and 3 scoring80% the remainder made minor error but scored 95 to 100 % .

Response to Results: I think assembling systems and/or studying complete systems from simple to more complex, as the semester progresses as this seems to interest students. More hands on work is great but time and space consuming. The use of symbols and reading of schematics, although not as much fun, needs to be stressed more in combination with the system parts so students understand why symbols are used.

Assessment Objective 4: Assess students ability to determine possible causes for problems with hydraulic systems. Presenting possible solutions then analyzing the solutions to see if they were applicable. Analyze failures to determine the causes.

Assessment Method: Show test equipment and analyze results on systems in the department. Watch case study DVD and discuss problems. Study failed parts to determine causes.

Assessment Results: All the students understood test equipment and how to use with specification to test systems.

Determining the cause of problems was difficult, in other words if there is a problem what could be wrong? Case studies were a in class quiz that went with DVD. Because I used discussion the results were 100%, however if there would have been no discussion or reasoning the results would have been more like 60% of the class with the right answer. Failure analysis was about the same, it took discussion and several ideas before the correct answer came forth as a consensus.

Response to Results: I plan to do more as this increased the discussion and also because some were eliminated the discussion opened many areas not typically discussed at length. And got more students involved in the solution or the possible solution. Plus it built confidence of the students in problem solving.

D. ABEN Graduate Program Assessment

1. ABEN graduate program outcomes

Program Outcome #1: Develop a knowledge base in Agricultural & Biosystems Engineering commensurate with the degree and research specialization.

Program Outcome #2: Integrate and apply principles of engineering and biological systems in the pursuit of original research.

Program Outcome #3: Disseminate original research results to the scientific community.

2. Program-level assessment results

The program-level assessment is carried out through the faculty advisor, graduate supervisory committee and NDSU Graduate School. Table E-1 lists the assessment plan for ABEN graduate students at the program level.

Table E-1. ABEN graduate program outcomes and assessment methods

Program Outcome	Assessment Methods
1. Develop a knowledge base in Agricultural & Biosystems Engineering commensurate with the degree and research specialization.	a. Plan of study to be approved by graduate supervisory committee. b. Completion of course work (no grade lower than B). c. Oral and written examination for doctoral students.
2. Integrate and apply principles of engineering and biological systems in the pursuit of original research	a. Research proposal to be presented to graduate supervisory committee. b. Completion of thesis (M.S.) or dissertation (Ph.D.)
3. Disseminate original research results to the scientific community	a. Presentation at scientific society meetings b. Publication in refereed journals

Students completing their M.S. or Ph.D. degrees within the department were generally successful at continuing to more advanced research positions (doctoral or post-doctoral research) or finding employment in academia, industry or government suitable to their degrees. Eight students completed their M.S. degrees one students completed their doctoral degree during 2011-2012.

Graduate students in the department have been productive in terms of presentations at scientific society meetings and refereed publications in scientific journals. In 2011-2012, 24 presentations coauthored with graduate students were made at professional meetings and 17 papers coauthored with graduate students were published in refereed scientific journals.

3. Course-level assessment results

Only one course was assessed during 2011-2012. The individual assessment report is provided by the faculty in which the individual faculty member discusses objectives, assessment method, assessment results, and their future plan in response to the assessment results in detail.

ABEN 765 Small Watershed Hydrology and Modeling (Jia)

<u>Learning Objective 1:</u> To understand the principles and processes of the hydrologic cycle for small watersheds.

<u>Assessment Methods:</u> Each student was asked to give a 2-3 min introduction about the student's major, research direction, hydrology courses that are taking or have taken, and expectations from this course. The background information is very critical for the success of the course when working with engineering and non-engineering students. The course was separated into two distinct sections, small watershed hydrology and review of hydrological modeling. The first section is used to achieve the first learning objective. A weekly assignment was required and accounted for 16% of students' grade. One in-class exam (20%) and one take-home exam (20%) were given at the end of the first section.

Assessment Results: Students were encouraged to work together to accomplish the weekly assignment. The instructor made herself available to students most times. Overall, the students did very well on most of the assignments. The students were told repeatedly that the final exam would be similar to the weekly assignments. A practice exam was given prior of the exam so that students became familiar to the exam style. However, students did not do well on the final exam, due to lack of preparation and time limit. Most of students did very well on the take-home exam, which showed that they have the knowledge and ability to solve problems independently.

Response to Results: Due to the distinct grade difference for the in-class exam, a make-up exam was given to the entire class to improve their grades. The average of the two exams accounted for 20% of their final grade.

Learning Objective 2: To understand major hydrologic models and their applications for surface flow, subsurface flow, nutrient and sediment transport and water quality on agricultural and natural lands.

Assessment Methods: Seven major types of hydrologic models and their applications were reviewed during the second half semester. Reading, writing, presentation and evaluation skills were presented to the class by the instructor. Team work and student's participation were emphasized during the second section. The students were asked to form a group of two students for two weeks, and changed team members for the next week, etc. till the end of the semester. The two students were asked to prepare and present the presentation together for the chosen model. The rest of the students were asked to grade their presentation according to a prepared grading sheet provided by the instructor. The presentation grade (14%) was the average grade of the instructor's and the students' grade. Questions and discussions were encouraged after each presentation.

Assessment Results: All students were able to rotate and work as a team to present their reviewed paper. However, discrepancy can be seen from some presentations and for some students due to their background and time spent on the course.

Response to Results: We only have five graduate students in spring 2012, which was perfect for the group presentations using two class periods. I provide oral feedback on their presentation immediately in the class, and I also provided them written report about their presentation and summary report.

F. Summary

Our teaching faculty members have been involved in continuous assessment activities. Assessments have been performed, results have been evaluated, and adjustments have been made in response to assessment results. Faculty members have learned that more planning of assessment activities is necessary for more effective assessment of student learning. A more detailed program and course assessment plan is necessary. The plan should include specific student or program outcomes and the associated methods to be used for assessment of the attainment of student or program outcomes. In addition, it is important to develop a template for individual course assessment, in which specific learning outcomes addressed in the course and evaluation rubrics and criteria should be included. It is also critical to develop and follow a timeline for the various processes used for program-level and course-level assessment. We have started to work on developing a new assessment plan for both ABEN and ASM majors. The plan draft is included in this report (Section F). The new plan will be finalized and approved by the teaching faculty in the coming year.

Dr. Scott Pryor, a member of our departmental assessment committee, serves in the University Assessment Committee (UAC) representing the College of Agriculture, Food Systems, and Natural Resources. We are aware that assistance is available from the UAC and we have invited UAC's director, Dr. Larry Peterson, to attend our assessment committee meeting to help us better understand UAC's new assessment guidelines.

Appendix A: Course Assessment Schedule for ABEN and ASM Majors from 2012-2024

Courses	Yr Offered	Term	Instructor	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
				2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
ABEN110	All	Fall	Pryor			Pryor			Pryor			Pryor			Pryor
ABEN189	All	Fall	Pryor	Pryor			Pryor			Pryor			Pryor		
ABEN255	All	Fall	Steele			Steele			Steele			Steele			Steele
ABEN358	Odd	Fall	Bon				Bon				Bon		Bon		Bon
ABEN452/652	All	Fall	Bon	Bon			Bon			Bon			Bon		
ABEN458/658	Even	Fall	Wiesenborn	Wiesenborn		Wiesenborn				Wiesenborn		Wiesenborn			
ABEN473/673	All	Fall	Bon		Bon			Bon			Bon			Bon	
ABEN479/679	Even	Fall	Bon	Bon		Bon				Bon		Bon			
ABEN484/684	Even	Fall	Jia	Jia				Jia		Jia		Jia			
ABEN486	All	Fall	Bora		Bora			Bora			Bora			Bora	
ABEN491	All	Fall	Backer	Backer			Backer			Backer			Backer		
ABEN747	Even	Fall	Lin	Lin		Lin				Lin		Lin			
ABEN263	All	Spring	Wiesenborn		Wiesenborn			Wiesenborn			Wiesenborn			Wiesenborn	
ABEN377	All	Spring	Lin		Lin			Lin			Lin			Lin	
ABEN444/644	Odd	Spring	Lin	Lin				Lin		Lin				Lin	
ABEN450/650	Odd	Spring	Pryor	Pryor				Pryor		Pryor				Pryor	
ABEN456/656	Even	Spring	Pryor		Pryor		Pryor				Pryor		Pryor		
ABEN464/664	Odd	Spring	Steele	Steele				Steele		Steele				Steele	
ABEN478/678	Odd	Spring	Bon		Bon		Bon				Bon		Bon		
ABEN482/682	All	Spring	Bon	Bon		Bon				Bon		Bon			
ABEN487	All	Spring	Bora		Bora			Bora			Bora			Bora	
ABEN765	Even	Spring	Lin		Lin		Lin				Lin		Lin		
	Total # of assessed ABEN courses:			**11**	**8**	**6**	**7**	**9**	**2**	**11**	**9**	**7**	**6**	**8**	**3**
ASM115	All	Fall	Bora			Bora			Bora			Bora			Bora
ASM125	All	Fall	Solseng		Solseng			Solseng			Solseng			Solseng	
ASM225	All	Fall	Steele			Steele			Steele			Steele			Steele
ASM354	All	Fall	Solseng			Solseng			Solseng			Solseng			Solseng
ASM378	All	Fall	Solseng	Solseng			Solseng			Solseng			Solseng		
ASM454/654	All	Fall	Bora			Bora			Bora			Bora			Bora
ASM264	All	Spring	Jia	Jia			Jia			Jia			Jia		
ASM323	All	Spring	Bon	Bon			Bon			Bon			Bon		
ASM373	All	Spring	Solseng		Solseng			Solseng			Solseng			Solseng	
ASM374	All	Spring	Solseng	Solseng			Solseng			Solseng			Solseng		
ASM429	All	Spring	Solseng			Solseng			Solseng			Solseng			Solseng
ASM475/675	All	Spring	Bora	Bora			Bora			Bora			Bora		
	Total # of assessed ASM courses:			**5**	**2**	**5**	**5**	**2**	**5**	**5**	**2**	**5**	**5**	**2**	**5**
	Total # of assessed courses:			**16**	**10**	**11**	**12**	**11**	**7**	**16**	**11**	**12**	**12**	**10**	**8**

Appendix B: Course Assessment Report Template

Department of Agricultural & Biosystems Engineering
Course Assessment Report

Course # & Title: ____

Term of Evaluation:____________________Instructor:____________________________

I. Assessment Objective: What do you want to assess and learn? The objectives could be subject matter related, teaching technique related, etc.

(Examples)
The assessment objectives for fall semester 2009 were to:

A. Determine how well the course met its objectives & student outcomes.
B. Gather ideas on appropriate course topics.
C. Obtain suggestions for improvement of instruction in the course.
D. Obtain feedback on the text used for Excel-related topics in the course.
E. Obtain feedback on the text used for AutoCAD-related topics in the course.
F. Measure gains in students' abilities to correctly evaluate spreadsheet formulas.

II. Outcomes Assessed & Evaluation Criterion:

(Examples)

ABET-a Apply knowledge of mathematics, science and engineering (course objective 1)
Rubric: Your grading strategy for an assignment on this topic. For example, (1) assignments were evaluated for student's ability to use the correct theory, realistic assumptions, show step wise calculations, use correct units, and reach logical conclusions, etc.
Evaluation criteria: 90% of students must show a significant improvement in knowledge gain between pre-test and post-test

ABET-b Design and conduct experiments, as well as to analyze and interpret data (course objective 2)
Rubric: Your grading strategy for an assignment on this topic. For example, assignments were evaluated for student's ability to plan/design an experiment, conduct the experiment following safe and scientific protocols, record data in excel, analyze data, interpret results and reach logical conclusions.
Evaluation criteria: 80% of students receive a grade of 70% or more

ABET-g An ability to communicate effectively
Rubric: Your grading strategy for an assignment on this topic or a presentation. For example, assignments were evaluated for student's ability to use an engineering format, use technical language, correct spelling and grammar, and effectively express their ideas. For

presentation, it could be concise and relevant content, good color contrast, spelling and grammar, ability to speak clearly, ask questions, etc

Evaluation criteria: 90% of students must show a significant improvement in communication skills before the course to after the course

ABET-k Use techniques, skills, and modern engineering tools necessary for engineering practice (course objective 1 & 2)

Rubric: Your grading strategy for an assignment on this topic. For example, assignments were evaluated for student's ability to achieve level I proficiency in Autocad (able to draw a plane view or 3-D view of simple objects, indicate limits and tolerances, indicate dimensions in proper units, label parts, etc).

Performance criteria: 80% of students receive a grade of 70% or more

ABEN-l Ability to apply engineering skills to agricultural, biomaterials and environmental systems

Rubric: Your grading strategy for an assignment on this topic. For example, assignments were evaluated for student's ability to incorporate relevant material properties, system function and requirements, etc.

Evaluation criteria: 80% of students receive a grade of 70% or more

III. Past changes made: You may use sample assignments or exams to evaluate these outcomes. Not all assignments need to be evaluated, just enough numbers to show that you achieve the above outcomes.

(Examples)

ABET-b Design and conduct experiments, as well as to analyze and interpret data

Two labs were introduced in 3-D graphics to increase the depth of knowledge

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ABET-g An ability to communicate effectively: examples used: lab 1 and lab 10

Students were introduced to engineering format for report writing

IV. Results of Assessment: You may use sample assignments or exams to evaluate these outcomes. Not all assignments need to be evaluated, just enough numbers to show that you achieve the above outcomes.

(Examples)

ABET-a Apply knowledge of mathematics, science and engineering

Examples hw 5 & exam 3: Evaluation of sample assignments show that 95% of a total of 25 students received a grade of 75% or above in hw 5, and 81% received a grade of 75% or above in exam 3. Based on these results, the evaluation criteria for outcome *a* was achieved.

Student feedback indicated an interest in exposure to AutoCAD applications in soil structure design

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ABET-g An ability to communicate effectively : examples used: lab 1 and lab 10
Out of a total of 24 students, 85% of students showed an improvement in their communication skills (lab 1 and lab 10 comparison), which show that the evaluation criteria for outcome g was not achieved.

V. Future Actions for continuous improvement

(Examples)
ABET-a Apply knowledge of mathematics, science and engineering
A lab assignment will be developed on soil structure design example with autocad.
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ABET-g An ability to communicate effectively: examples used: lab 1 and lab 10
Students will be provided with a written guidelines containing specific instruction on lab report format, along with a sample lab.

Appendix C: Self-Reporting of Levels of Implementation