South Carolina Advanced Technology Education Center of Excellence
National Peer Review of Engineering Technology Core Curricula

Madren Center, Clemson University
April 25-27, 2001

REPORT

Overview

The South Carolina Advanced Technology Education Center of Excellence (SC ATE) is a statewide systemic initiative designed to increase the quantity, quality, and diversity of engineering technology students throughout the state's 16 technical colleges. Funded by the National Science Foundation (NSF) and the SC State Board for Technical and Comprehensive Education, SC ATE is one of 11 NSF-sponsored Centers of Excellence in the nation. SC ATE is designing, pilot testing, and refining a one-semester Technology Gateway pre-engineering technology curriculum and an Engineering Technology (ET) Core curriculum that is part of the first-year engineering technology curriculum. The Technology Gateway and ET Core curricula incorporate the study of English, physics, and mathematics into a framework of "real world," technology-based problems. The SC ATE curriculum is made up of problem scenarios that provide a vehicle for integration of course content from these disciplines. The Technology Gateway and ET Core curricula use a problem-based, interdisciplinary, team approach to teaching and learning. SC ATE materials are designed to be supplemented by faculty-selected commercial textbooks to support the curriculum disciplines. Teacher resource materials and assessment tools are developed by instructors or selected from textbooks or other faculty resources.

National Peer Review Process

As part of the SC ATE curricula development process, the first Curriculum Peer Review meeting took place at the Madren Center, Clemson University, September 24-25, 1999. A panel of national experts reviewed the curricular materials for the Technology Gateway--Pre-ET and the ET Core Electrical. Using the recommendations that resulted from the meeting, the curricula were revised. A second peer review meeting was held with (all but one of) the same panel of experts reviewing subsequently developed materials in the ET Core Curriculum. The second Curriculum Peer Review meeting was held April 25-27, 2001 at the Madren Center at Clemson University. The following 10 persons served as peer reviewers:

NATIONAL PEER REVIEW PANEL			
Nane	**Expertise**	**Institution**	**Address**
Arnold Packer	SCANS Competencies	Johns Hopkins University	3704 N. Charles Street Baltimore MD 21218
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James Barrott	Engineering Technology	Dean, Engineering, Environmental, and Emergency Technology, Chattanooga State Technical Community College	4501 Amnicola Highway Chattanooga, TN 37406-1097
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Nan Peck	Speech Communications	Northern Virginia Community College	Annandale Campus 8333 Little River Turnpike, Annandale, VA 22003-3796
Richard Satchwell	Integrated Mathematics, Science, and Technology	Coordinator, ImaST Coordinator, Center for Mathematics, Science, and Technology	207 South Main Street Campus Box 5960 Normal, IL 61790-5960
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To guide the reviews, staff of SC ATE and the National Dropout Prevention Center at Clemson University developed sets of questions and criteria for assessing the ET Core Curriculum and 11 of the projects that are a part of the ET Core Curriculum.

The Curricula Peer Review meeting began with dinner at 7:00 PM Wednesday, April 25, 2001. The SC ATE management team presented a brief overview of what had been accomplished since the first Curriculum Peer Review meeting. On Thursday, April 26th,

the reviewers were divided into two groups and asked to review specific project materials and ET Core curriculum. A set of discussion questions guided their responses to a set of specific criteria for the separate projects and for the ET Core. ATE faculty members were available during the afternoon to answer reviewers' questions. During the morning of April 27th, the reviewers again met in two groups and completed their reviews. The meeting continued after the morning break with a general discussion and comments. The meeting adjourned at noon.

Discussion Summary

The national peer reviewers were conscientious, thorough, and meticulous in reviewing each project. Their general comments indicate the program is producing a curriculum that reforms and improves Engineering Technology and that the program is an outstanding and unique example of best practices. The SC ATE Management Team was commended for the hard work, exemplary teamwork, and good management that led to the accomplishments thus far. The peer reviewers felt a real accomplishment was bringing faculty from different disciplines together to work with the curriculum in the technical colleges. Comments indicated that the projects promote dialogue, questioning, and investigations that help students construct their own definitions of concepts.

Since the objective of having the peer review was to garner suggestions for improving the curriculum, the following comments in no way negate the panel's praise for producing an extraordinarily creative and effective approach to teaching and learning Engineering Technology. In a general discussion at the conclusion of the meeting, the peer reviewers highlighted some of the recommendations that appear in the reviews following this section.

- The design of the curriculum should be basic and easy to follow: each project should have a set place for the objectives, for the scenario, and for the background. Colors and designs should be consistent. Background information for teachers should be different than the background information for students. Additional information should be provided to teachers such as suggested learning paths. Resources should be separate and contain examples of student work and teacher-developed materials.

- Check scenarios in the projects to ensure that the solutions are more realistic. Faculty teams might work together to identify possible solutions prior to presenting the project to students. Common sense should guide the solutions and a standard of "reasonableness" should be discussed. A period of discussion or reflection should be included at the end of each project to determine if the solutions are practical and realistic.

- There is a need for clearly stated objectives and outcomes for the entire curriculum. The outcomes and assessment processes should clearly address what students are expected to produce, demonstrate, or learn. There was consensus

among the reviewers that the communication component of each project needs to be enhanced. There should be benchmarks for projects as the students progress from one project to another. A need to know chart might be included for students for each project.

SCATE ET Core General Review

General Comments:

We commend the effort to move toward developing materials that promote the SCANS skills as well as the new ABET criteria in students. Can you write the assessment to measure what the student will be able to do after three semesters and provide evidence (in the assessment) that the students can not only do the math and science (shown by grades) but can also work in teams, deliver a presentation, think systemically, etc. The CAPSTONE project (senior project) might be a good way to measure the performance of the ATE group compared with the non-ATE groups.

There is a great deal of potential in the process that has been developed to implement this work. We hope you will seek additional funds to disseminate this PROCESS more widely. We hope the model, which has been used to foster a teaching and learning community, can be shared more widely.

We think more needs to be done with assessment. For example, there needs to be rubrics as well as examples of both good and bad work to guide teachers in their assessment of both individual and group work. The competencies are listed for each project, in some cases a great number are listed. How are these competencies measured in each project?

SCATE should consider the general outcomes for the three-semester period. What should the students be able to do after the completion of this three-semester period. Did the students meet these outcomes? How do we assess if the students met these five to ten outcomes. How do these outcomes compare, for example, to the SCANS skills?

Overall, this team was very impressed with the achievements that have been made by SCATE in creating a revolutionary way of teaching and training students to enter today's advanced technology fields.

Discussion Questions

1. **How well does the problem-based structure of the projects support the contextual and constructive learning needs of students?**

   Overall, the scenarios are good examples to motivate discussion. Contextually, the communication skills do not fit very well into the scenarios as they are written. For math/science, the scenarios provide a need to know. Constructively, it doesn't seem to be purely constructivist since so many of the "workshops" seem to indicate that the

teacher will demonstrate. However, the scenarios seem to promote dialogue, questioning, and investigations that help students construct their own definitions of concepts. However, the chipper and thermal scenarios do promote constructivist activities. The teacher teams provide a good model for collaborative learning and problem solving. The scenarios provide good models for showing 'the need to know' model, especially if they all used the KNK tables. The review team felt that there are some good scenarios in the ET Core that support the contextual and constructive learning needs of the students.

Recommendations: (1) There should be some sort of template for the design of the projects for consistency. For example, each project should have a set place for the objectives, for the scenario, for the background, etc. (2) Each project should have a similar "template" or look. For example, each project should have a "Need to Know" chart available to students. (3) Before the teachers and students begin a particular project, they all should meet together and discuss the nature of the problem and possible solutions. Students need to know what is clearly expected of them so that they do not become frustrated when they discover that the rules of the game have changed.

2. Is the background information appropriate and complete enough for students?

Overall for most projects, yes, but for Thermal 1 and Mechanical 5, no. Optics 2 and Mechanical 4 were well done. In some cases (Mechanical Projects #2 and #3), the background information was very complete and appropriate, while in other cases, there was need for improvement (Optics project #1, Fluids project #1). Often the background information was general in nature and not very specific in helping define the goals of the project.

Recommendations: (1) Consider what the intent of the background information is and be consistent with the level of background provided to the student. (2) There should be additional information available to teachers. Again, be consistent with what the intent of the information is and to what level the information in the project contains contextual information. (3) Background information for teachers should be different than the background information for students. Additional information should be provided to teachers such as suggested learning paths. (4) There are inconsistencies with the Concept Maps. In some cases there is, what seems to be, extraneous information in some maps. (5) Colors and designs should be consistent. (6) The communication component of each project needs to be enhanced. There is not much in the background information for students to help them define things such as "what makes a good presentation." Students need specific directions.

3. If not, what should be added to ensure the projects are complete?

In many cases, the task for the student is not well defined. In many cases, there needs to be more background information for the team of teachers who will teach the material. Better written, measurable outcomes/objectives need to be included. It is

vital that every faculty team member have sufficient background information before being asked to teach the project.

Recommendation: An instructor's reference manual should be put together illustrating some of the better solutions, good solutions, and examples of solutions that show less thought. A comparison of results and a discussion would be useful. There should be time for reflection and comparisons after the presentations, and the guide for the instructor might include good questions for comparison. Instructor should help the students use the "do, measure, reflect" cycle throughout the process. Each faculty member should actually carry out the problem before they teach it. Here is where a week or two-week intensive faculty-training workshop led by teachers who have actually taught this module would be most helpful.

4. **Does the ET Core Curriculum sufficiently cover the body of knowledge for the general education (math, physics, communications) requirements of ET majors?**

The SCATE staff has done a good job in planning a sequence to cover the appropriate knowledge. It would seem that the projects indicate the appropriate knowledge is to be covered. However, it is difficult to know to what degree these topics are being mastered by students, and if, after a year, this group can perform as well as the traditional classes on appropriate instruments. In most cases, the ET Core does a good job in covering and integrating the body of knowledge for the general education components of the ET majors. There was little to suggest, however, that quality control was ever discussed and used.

Recommendation: More work needs to be done on the scope and sequence for communications. Statistics seems to be minimally covered. Everyone needs a good foundation in not only description statistics but statistics that help explain error and variability in samples. Include some use of systems diagrams to promote the higher-level SCANS skills.

5. **How clear are the materials for use by others who are unfamiliar with them?**

Marginally. There would be need to be faculty development before teachers use the materials. More resources need to be included that provide users with information. There must be some kind of rubric that clearly demonstrates how to assess what is to be taught and how it is to be measured.

The various projects in their current state vary greatly in their ease of use with faculty who would be unfamiliar with them. Some type of instructor's guide or implementation manual should be developed that would include features such as typical solutions or approaches to solving a particular problem. The team realizes that in certain cases there may be more than one solution and urges the development team to include this in such a manual. It would be nice to have comments and suggestions from faculty who have had the experience of testing particular projects included in the manual. Some type of "Watch Out for This!" list would be helpful

6. **How well do (think) the materials develop the knowledge and skills needed in industry (SCANS skills)?**

   In some cases very well. Each project stresses the importance of presentation skills. The process skills required of students are also addressed well. However, in some cases, some of the scenarios were somewhat unrealistic, and there is not enough checking against common sense. There needs to be some type of feed back loop to check a solution and see if it is appropriate. It would be nice for the teaching team to have a set of the common "misconceptions" often held by students. In developing a solution to a problem it is not only important to plan, do, and measure but also reflect. There needs to be more "reflection" on the final solution. There should be opportunities for reflection throughout the project.

7. **How well do (think) the materials support the transfer of content skills and knowledge (MSC) to workplace application?**

   One group said they have no way of knowing this. The other group said that in some cases the materials support the transfer very well, but in some of the projects there is room for improvement. There was not any kind of rubric for how the students are assessed in the math, physics, and technologies. Also missing in the projects are the important concepts of statistical quality control.

8. **Are suggested resources adequate to supplement the materials?**

   Woefully inadequate for the instructors. Additional work done by students and graded by faculty would have been helpful. Time for a dialogue with the instructors would have been helpful.

   Recommendation: Can a more direct link to a specific and real problem from industry be included? Many other projects have found good problems from industry that could supplement these scenarios.

9. **How accurate is the content of the materials?**

   In most cases the content is very accurate. There are a few mistakes or perhaps misprints in the material. For example, in the background information on page two of the Materials Project #2, the statement is made: "The resulting change in the size (length) is called strain." Actually it is the ratio of the change in length to the original length that is the strain. This ratio is sometimes called the "fractional change" in length.

10. **How well do the materials integrate knowledge and skills from the mathematics, physics, engineering technology, and communications disciplines?**

Seems that the topics have been interwoven to provide just-in-time teaching around a physics backbone. In many cases, the materials do a good job in integrating the knowledge and skills from math, physics, engineering tech, and communications. The communications component, however, is not integrated as well.

Recommendation: Statistics should be integrated throughout.

11. **How well do the materials correlate with accepted discipline-specific standards**?

For the most part, the team is very impressed with the way the projects foster the latest discipline-specific standards. The writing seems to be covered well, but the materials do not seem to meet the speaking/listening standards. There is no evidence to show that the teaching in math is as reform-oriented as the PBL approach used overall. How can we tell if, when the math teacher comes in to teach a lesson, they don't use traditional lecture? It would seem, with all the evidence around, this would not be the case, however, it would be helpful to see how the workshops are structured. This material is moving toward meeting the new ABET criteria. What is missing, is any material on ethics (NJCATE). In addition, some of the social issues (e.g., pollution) are not dealt with.

12. How effectively do the materials foster team teaching among faculty from the project disciplines?

We commend the project for fostering the collaboration among faculty who plan and organize experiences that assist all types of students. Is it team teaching or team planning? The materials provide the dynamics to set up team teaching, however, the planning necessary to cover the material necessitates team planning. The materials have the potential to be very effective in fostering team teaching provided faculty receive the proper training. The team was very impressed that teachers from the math, physics, technology, and communications areas are working together as a team to help students build the kinds of skills they can transfer to industry. This is very rare among the two-year community/technical colleges across the United States. This team felt it would have been nice to see at least one example of student work for each project included with the materials the team was asked to review.

Criteria Ratings of ET Core—Group 1

To what degree do all of the project materials of the ET Core achieve the following:

1 = not at all 2 = little 3 = somewhat 4 = mostly 5 = completely

1.	Facilitate student contextual/constructive learning	1	2	**x**	4	5
2.	Provide complete background information	**x**	2	3	4	5
3.	Cover content knowledge and skills	1	2	**x**	4	5
4.	Demonstrate innovative instructional approaches	1	2	**x**	4	5
5.	Supply adequate resources to supplement materials	1	**x**	3	4	5
6.	Provide useful instructional materials for others to implement the ET Core	1	**x**	3	4	5
7.	Contain accurate materials	1	2	3	**x**	5
8.	Correlate with accepted discipline standards	1	2	**x**	4	5
9.	Integrate the targeted disciplines	1	2	**x**	4	5
10.	Promote faculty teaming	1	2	3	**x**	5
11.	Meet needs of industry	1	2	3	**x**	5

Criteria Ratings of ET Core—Group 2

To what degree do all of the project materials of the ET Core achieve the following:

1 = not at all 2 = little 3 = somewhat 4 = mostly 5 = completely

1.	Facilitate student contextual/constructive learning	1	2	3	**x**	5
2.	Provide complete background information	1	2	**x**	4	5
3.	Cover content knowledge and skills	1	2	3	**x**	5
4.	Demonstrate innovative instructional approaches	1	2	3	4	**x**
5.	Supply adequate resources to supplement materials	1	2	**x**	4	5
6.	Provide useful instructional materials for others to implement the ET Core	1	**x**	3	4	5
7.	Contain accurate materials	1	2	3	4	**x**
8.	Correlate with accepted discipline standards	1	2	3	4	**x**
9.	Integrate the targeted disciplines	1	2	3	**x**	5
10.	Promote faculty teaming	1	2	3	**x**	5
11.	Meet needs of industry	1	2	**x**	4	5

ET Core Project Reviews

and Ratings

SC ATE ET Core Project Review
2nd and 3rd Semesters

Project # and Title: **Fluids #1**

Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   The project seems very open-ended. Was this done on purpose? Many of the team felt this project should be placed in the third semester. Several members felt a better example would make the project stronger such as calculating the pressure in a building due to a tall water tower.

2. Does the Student Handout include information pertinent to students' needs?

   The drawing on page 2 of the student handout is incomplete and unclear has to what concept is being shown. One team member felt that the Bernoulli equation should be omitted unless it is going to be derived.

3. Are the stated Objectives clear and appropriate for the content of this project?

   Mixed feeling here. Some feel yes provided better drawings are given to the students to illustrate the principles. Others felt the notes to the instructor are unclear. What is h_{elbow} and h_{pipe} ? Are students going to be able to derive such equations without a better background in these topics?

4. Is the Background Information appropriate and useful for students?
   The background information is general in nature. It may not be particular useful in its present form to help students with the problem. The diagram given to the students in their guide (page 2) appears to be missing parts of it.

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   The “Notes” contains some type of derivation for the height of piping for the shower but is useless to the instructor unless ALL terms are clearly defined. A drawing is essential here. In its current form the derivation is not particularly useful to the instructor.

6. Are Student Competencies well stated and consistent with the Content Strands of this project?

   The technology strands appear to be missing from the list of student competencies.

7. Do Student Assessment strategies measure valuable workplace skills?

   Yes for general skills such as workplace skills, presentation, etc. but it would be helpful for future teachers who might use these materials to have better guidelines for how they would evaluate the shower design.

Project # and Title: **Thermal #1**

Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   Clear: No. Objective for the team is not clearly stated. The scenario is poorly written. The design of the plant is not appropriate for first year ET students.

2. Does the Student Handout include information pertinent to students' needs?

   Incomplete. No objectives or tasks are stated. No background information given in student handout.

3. Are the stated Objectives clear and appropriate for the content of this project?

   Objectives not stated. No background information given in student handout.

4. Is the Background Information appropriate and useful for students?

   None given on a student handout. Strategies can't be determines without clear objectives.

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   Somewhat. Without objectives cannot say. Needs to focus on what the students needs to be able to do.

6. Are Student Competencies well stated and consistent with the Content Strands of this project?

   Too many competencies. Need to pare down once the objectives are identified.
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7. Do Student Assessment strategies measure valuable workplace skills?

   No. Need to be stated in terms of what student will be able to do.

Project # and Title: **Optics #1**

Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major? Among the comments of Team 1 were:

   Some of the projects are not well defined in that more parameters should be given to the students. In some cases, the team felt ray diagrams would be helpful to include in the background information on page 2 of the student handout.

2. Does the Student Handout include information pertinent to students' needs?

   Several members of Team 1 felt that there was not enough information given to the students to solve this problem. We can only conclude that the instructor via handouts, textbooks, etc covers more materials on concepts and principles.

3. Are the stated Objectives clear and appropriate for the content of this project?

   Most of the team members agreed that the stated objectives were clear and appropriate.

4. Is the Background Information appropriate and useful for students?

   Many of the team members feel more background information should be given to the students. For example, what are the sizes of the objects that are being assembled?

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   The notes are definitely useful. Again, it would have been clearer to the teacher and students if they had at least a rough idea of the size of the parts they would be assembling.

6. Are Student Competencies well stated and consistent with the Content Strands of this project?

No. It appears that only traditional physics competencies are shown. There should be a technology strand included in the competencies.

7. Do Student Assessment strategies measure valuable workplace skills?

   Some of the comments were: "No. It appears that only traditional physics competencies are shown. There should be a technology strand included in the competencies." "Yes, but how do you assess costs unless some idea of the size of the product and process is known." "We need a rubric on how students are assessed."

Overall, the team felt this is a good project, however, more details about the mfg. process and the product to be viewed needs to be included.

Project # and Title: **Optics 2**
Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   Scenario is plausible. Students should be able to picture a technician in a laboratory making these measurements.

2. Does the Student Handout include information pertinent to students' needs?

   Student expectations (outcomes) are poorly delineated.

3. Are the stated Objectives clear and appropriate for the content of this project?

   Functioning of an inferometer may be common knowledge to a physicist, but not to the student or instructor. A description of the operation of the inferometer should be included in the handouts, with greater detail in the instructor's copy.

4. Is the Background Information appropriate and useful for students?

   No response to this question.

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   Workplace competencies and student assessment strategies are poorly articulated. What will the students be able to do (out there) as a result of completing this learning activity? What will the students do during the activity to demonstrate they have met the activities outcomes?

6. Are Student Competencies well stated and consistent with the Content Strands of this project?

   No response to this question

7. Do Student Assessment strategies measure valuable workplace skills?

   No response to this question

Project # and Title: **Materials #1**

Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   Clear: The scenario is clear but the too little information is available.
   Motivating: Yes, we believe it can be. There are several opportunities that could be fun experiments for students. The concept map, and student competencies indicate some experiences with other materials might be included which is broader than the indicated scope of the scenario.
   Reasonable: Very much so. Seems appropriate for a couple of weeks.

2. Does the Student Handout include information pertinent to students' needs?

   The student handout is very brief; however, the student concept map is very broad.

3. Are the stated Objectives clear and appropriate for the content of this project?

   The objectives are clear for this project. If the project is to determine properties of materials, then the objectives need to be expanded. There are no objectives for communication. They should include skills that relate to the Q/A; listening, extemporaneous speaking.

4. Is the Background Information appropriate and useful for students?

   No. There is no background information. Some of the information isn't appropriate.

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   It seems that the scenario is very specific, aimed at paper, while the teaching strategies indicate a broader approach. The assessment is based on what is done

with paper. The background information needs to include what attributes of paper can/should be measured to meet the publisher's needs. #5 could be expanded to say how the spreadsheet will be used construct tables and graphs using spreadsheets; 3,4B,8,9,10 seem to be unrelated to the scenario.
Bring the communications person in to discuss Q/A scenarios.

6. Are Student Competencies well stated and consistent with the Content Strands of this project?

   Include competencies in dealing with Q/A situations.
   The competencies are a great deal broader than the scenario as are the content strands (chemical equations? what materials?)

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7. Do Student Assessment strategies measure valuable workplace skills?

   Yes. The ability to take data, organize it, and analyze it is important. In the last paragraph, maybe instead of "and the solution" say "and an understanding of the process."

Project # and Title: Materials #2

Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   Again some of the members of the team felt the problem is too open-ended. Students should be given some idea of the material they are going to use, thickness, etc. Difficult to design a press without

2. Does the Student Handout include information pertinent to students' needs?

   There needs to be some type of drawing for the students to see. This is equally true for the faculty who may use the module in the future. More information about the bolts, cross piece, etc needs to be given to the student.

3. Are the stated Objectives clear and appropriate for the content of this project?

   One member said, "A bulleted list of problem goals would help."

4. Is the Background Information appropriate and useful for students?

   The background information is informative but not of any specific use to the student in solving the problem. There is also a mistake in the definition of strain.

It is not the change in length but rather the fractional change in length (e.g., $\Delta L/L$ not ΔL).

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   The “Notes” contains some very good pre-project activities for the students to do. But there needs to be more information given to the teacher about the parameters of the medallion and press so that he/she may guide the students toward a solution.

6. Are Student Competencies well-stated and consistent with the Content Strands of this project?

   The technology strands appear to be missing from the list of student competencies.

7. Do Student Assessment strategies measure valuable workplace skills?

   Yes for general skills such as workplace skills, presentation, etc. but it would be helpful for future teachers who might use these materials to have better guidelines for how they would assess the students’ design of the press.

   Note: Some of the team felt that a better choice for a problem would be the design of a structure which would hold a certain load (bridge, truss, shear pin, etc). Current problem has good potential but lacks sufficient data to solve in its present form.

Project # and Title: **Mechanical #1**

Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   Yes, the team felt this scenario was clear and reasonable for students in the first year.

2. Does the Student Handout include information pertinent to students' needs?

   Again the team felt the information was pertinent to students’ needs.

3. Are the stated Objectives clear and appropriate for the content of this project?

Most of the team members agreed that the stated objectives were clear and appropriate. One reviewer felt the problem as stated was too open ended and vague. Does the plastic interior enter the room at the same time as the exterior door? One team member felt that the project needs to address the profit / economic side of the problem.

4. Is the Background Information appropriate and useful for students?

   While no member of the team denied the importance of understanding vectors, it was not clear to them how vector analysis would be used in this particular project.

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   Yes, the notes were helpful.

6. Are Student Competencies well-stated and consistent with the Content Strands of this project?

   Many of the team members felt there were too many competencies listed, and, in some cases, they were misleading or irrelevant to the problem.

7. Do Student Assessment strategies measure valuable workplace skills?

   There appears to be no specific strategies or rubrics given for measuring workplace skills. It is also not clear how the assessment will be carried out.

Overall, the team felt this is a good project however if vector analysis was an important outcome of this project, the team did not see how it would relate to this particular project.

Project # and Title: Mechanical #2

Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   Some of the team members were not sure that a 4-meter drop would be reasonable for this problem.

2. Does the Student Handout include information pertinent to students' needs?

   For the most part, yes.

3. Are the stated Objectives clear and appropriate for the content of this project?

   There was some disagreement here among the team. Some felt that the objectives were clear while some felt a drawing or better description of the storage process for the radios would be helpful

4. Is the Background Information appropriate and useful for students?

   One team member commented: “Appropriate as an overview but not specifically useful without instruction”

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   Yes, the notes were helpful.

6. Are Student Competencies well-stated and consistent with the Content Strands of this project?

   For the most part yes but one team member wrote: “Comparison-contrast not specified. Memo/letter format are adequate. Technical report = project completion report. The samples of student reports were weak.”

7. Do Student Assessment strategies measure valuable workplace skills?
   There appears to be no specific strategies or rubrics given for measuring workplace skills.

Team members liked this project better than Mechanical #1. The objectives talk about compare and contrast but in reality what? Change the parameters of the chute? Or final velocity?

Project # and Title: Mechanical #3

Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   Yes

2. Does the Student Handout include information pertinent to students' needs?

   Yes

3. Are the stated Objectives clear and appropriate for the content of this project?

   Yes, but some of the team members were not sure why scalar products was an important objective.

4. Is the Background Information appropriate and useful for students?

   Yes

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   Yes, the notes were helpful.

6. Are Student Competencies well-stated and consistent with the Content Strands of this project?

   Yes but the team felt that rotational motion should have been listed along with the other physics content strands. It also was not clear to some why statistics was listed as an integrated skill.

7. Do Student Assessment strategies measure valuable workplace skills?

   Yes, but again some of the team members felt the project should give a better plan or rubric for assessing such skills.

Overall, the team liked this project best of the three mechanical projects. They liked the fact that students must go to real equipment catalogs and choose things like gear reducers, etc. much like a real engineer would have to do.

Project # and Title: Mechanical #4
Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   Clear: Yes
   Motivating: Yes. It isn't as clear that this is a 'real' application and therefore might be less motivating.
   Reasonable: It seems so. However, the research on the Internet would be time consuming.

2. Does the Student Handout include information pertinent to students' needs?

   The *Meet the Problem* section (in the teachers notes) might be included for the

students. This gives direction for the student. Some parameters regarding the type of machinery selected might be included.

3. Are the stated Objectives clear and appropriate for the content of this project?

   The first objective isn't needed if it was done in #2, otherwise, clear. Maybe the last objective could be rewritten to say "apply the conditions of equilibrium to 3-dimensional objects."

4. Is the Background Information appropriate and useful for students?

   Appropriate if the vector information in #2 was covered. Clarify what the options are for the selection of mechanical equipment. It would seem that leaving the choice completely up to the student makes the teacher have to work every different problem-or trust the students.

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   Yes, but #6 seems to be out of place and not germane to this project. In the concept map, clarify the conditions of equilibrium.

6. Are Student Competencies well stated and consistent with the Content Strands of this project?

   Yes. A large number of them, so they could be consolidated.

7. Do Student Assessment strategies measure valuable workplace skills?

   The assessment criteria don't demonstrate measures of student performance, they indicate what the instructor will do.

Project # and Title: Mechanical #5

Discussion Questions:

1. Is the Problem Scenario clear, motivating, and reasonable for students in the first year of an ET major?

   Clear: Yes. A picture of this would be nice. We assume the dimensions of the chipper are reasonable.
   Motivating: Marginally so. It seems there is not much information on the chipper so the amount of force needed to stop it can only be calculated based on assumptions.
   Reasonable: The problem seems very ambitious. How will the force needed to make the calculations be made if the design of the brake is so difficult? It seems

that this is beyond the scope of first year students. Is the resume and card appropriate here? They should be written into the scenario as they make their presentation. They should be able to prepare document that appropriate in quality.

2. Does the Student Handout include information pertinent to students' needs?

   They need more background information on the design of the chipper. Again, students may find lots of different styles and designs that the teacher may have to 'accept' as valid.

3. Are the stated Objectives clear and appropriate for the content of this project?

   #1 (resume) doesn't fit here unless the scenario is changed. The last objective (design) is rather ambitious for a first year a student. Mass of the chipper wheel is not given.

4. Is the Background Information appropriate and useful for students?

   It doesn't seem to be complete without the design and mass of the wheel. Teaching strategies lack creativity.

5. Do the "Notes to the Instructor" in the Instructor's Guide suggest useful teaching strategies for faculty?

   The notes are rather vague and incomplete; #6 should be deleted.

6. Are Student Competencies well stated and consistent with the Content Strands of this project?

   The communication competencies seem contrived. Are the ones involving data acquisition necessary? There is a disconnect between the teaching strategies and the competencies. In math, the direct variation isn't mentioned in the competencies.

7. Do Student Assessment strategies measure valuable workplace skills?

   The strategies are faculty oriented rather than learner-oriented. The communication competencies aren't assessed on an individual basis (as in others too). Assessment must focus on what the students will be able to do at the end of the project.

   The problem with this scenario was with the unknowns around the chipper. Maybe a bicycle wheel could be used instead and actual data taken.

ET Core Project Ratings

1. Present an appropriate workplace problem scenario?
2. State clear objectives and student expectations?
3. Provide adequate background information related to the topic?
4. Provide creative and useful teaching strategies for faculty?
5. Include valuable workplace competencies and student assessment strategies?

Rating Scale

1 = not at all 2 = little 3 = somewhat 4 = mostly 5 = completely

PROJECT	**STATEMENT RATINGS**				
	1	**2**	**3**	**4**	**5**
Fluids #1	4	3	3	3	3
Thermal #1	2	3	2	1	2
Optics #1	4	3	3	3	4
Optics #2	4	2	2	3	3
Materials #1	3	4	4	3	4
Materials #2	2	3	3	4	2
Mechanical #1	4	2	3	4	3
Mechanical #2	3	4	3	3	3
Mechanical #3	5	4	4	4	4
Mechanical #4	3	3	3	4	4
Mechanical #5	3	3	2	2	2