TENNESSEE TECHNOLOGICAL UNIVERSITY

Quality Enhancement Plan

Improving Critical Thinking and Real-World Problem Solving Skills

A Component of SACS Reaffirmation of Accreditation

February 2006

Table of Contents

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Introduction

The Quality Enhancement Plan presented in this document represents the culmination of a process that began over three years ago. This process began with our efforts to identify a vision for the University. A broad spectrum of the University community participated in the process of identifying our existing strengths, the current and future challenges to our institution and higher education in general, and realistic opportunities for our success. One common idea emerged from this process that had broad implications for all areas of the University. This idea involved a broad commitment to improving the life-long success of our students and alumni. This vision was enthusiastically embraced by our current students, faculty, alumni, and community leaders.

As you read our Quality Enhancement Plan, you will notice that it strongly supports our new vision and is an integral component of our strategic plan. Our institution is strongly committed to making this Quality Enhancement Plan successful.

Robert Bell
President

Tennessee Technological University

Vision

TTU will be one of the best universities in the nation through a commitment to the life-long success of our students.

See Appendix E for more detailed information about Tennessee Technological University's strategic plan.

Executive Summary
Quality Enhancement Plan

Title

Improving students' critical thinking/real-world problem solving skills through the use of active learning strategies.

Description of Focus

The QEP's primary focus is on improving students' critical thinking and real-world problem solving skills through the use of exemplary and innovative active learning strategies that contribute to their life-long success. To help achieve success in this area and encourage the broadest possible campus participation in this endeavor, we have also identified three areas of emphasis that units may pursue to help improve critical thinking and real-world problem solving skills. These areas of emphasis within the broader topic include the following:

- Improving students' critical thinking/real-world problem solving skills with emphasis on communication skills.
- Improving students' critical thinking/real-world problem solving skills with emphasis on teamwork skills.
- Improving students' critical thinking/real-world problem solving skills with emphasis on creative thinking.

Rationale & Process

Several constraints played an important role in helping us develop a QEP that would become a key element in our overall strategic plan and an important part of our real function as a university. One constraint was the convergence of several important planning tasks in a short period of time. Within a two-year span, our University needed to develop a University vision, a revised mission statement, a new five-year strategic plan, and a QEP for SACS. While these tasks initially seemed daunting, we eventually realized that the convergence of these activities provided opportunities for integration and efficiency that made each task easier.

Clearly, the development of a vision for the future for our university was the biggest challenge. A careful assessment of our strengths and opportunities to excel on a national level brought us to the realization that our graduates are highly regarded by employers and that our best opportunity to excel on a national level would depend on our doing even more to improve their "life-long success." This core idea in our vision became the common theme for all subsequent planning tasks.

Several other factors played an important role in helping us define the focus of our QEP. Specifically, we carefully examined a large collection of assessment data (test scores, teaching evaluations, student surveys, alumni surveys, and employer surveys) for weaknesses that could negatively impact our new vision. Once we had identified important areas of weakness, we conducted numerous focus groups with our faculty and students to help identify the areas of weakness that the campus was most interested in addressing. The QEP topic identified above represents the culmination of these efforts. This QEP topic will become an essential component of our strategic plan to support our vision.

Development Process

Background

The development of a Quality Enhancement Plan that adds real value to a university and engages a broad spectrum of the faculty and staff in efforts to improve student learning is a challenge for any institution. Perhaps the biggest pitfall for QEP proposals is that they end up becoming just another compliance activity that most employees regard as something that is incidental to the real function of the university or even a distraction.

Several constraints played an important role in helping us develop a QEP that would become a key element in our overall strategic plan and an important part of our real function as a university. One constraint was the convergence of several important planning tasks in a short period of time. Within a two-year span our university needed to develop a University vision, a revised mission statement, and a new five-year strategic plan, and a QEP for SACS. While these tasks initially seemed daunting, we eventually realized that the convergence of these activities in time provided opportunities for integration and efficiency that made each task easier. A second constraint that helped insure success was the general dissatisfaction with the existing fragmented approach to planning that served to satisfy compliance standards more than quality improvement.

Clearly, the development of a vision of the future for our university was the biggest challenge. Several previous attempts to accomplish this task had failed to produce an idea the University community would embrace. Balancing the interests and aspirations of the president, faculty, staff, students, and alumni donors at a diverse technological university is quite difficult - even in good economic times. The president and many others wanted the University to have a national prominence. The real question ultimately became, "What would be the basis for this national recognition?" It took the vision committee about two weeks to realize where our strength and opportunity to excel existed, and another six months to figure out how to word that concept. Our graduates are highly regarded by employers and our opportunity for national recognition would depend on our doing even more to improve their "life-long" success.

In the process of discussing this vision with groups of faculty, students, and alumni, we began to see that there were many opportunities for making improvements to the University community and experience that could help us accomplish the vision. The QEP could focus on one area for improving student learning while other strategic goals would be needed to improve other areas that would be essential for success.

Although the vision committee identified the underlying concept, the exact wording of the idea was based on feedback from various focus groups involving faculty, students, alumni, and community leaders. In the final analysis, the success of the new vision statement was due in part to its simplicity and relevance for all at the University.

TTU Vision

TTU will be one of the best universities in the nation through a commitment to the life-long success of our students.

The articulation of this vision greatly simplified the task of selecting possible topics for the QEP. The QEP task would involve two major subtasks:

1. Identifying areas of weakness in student learning that can significantly impact students' life-long success (using available assessment data).
2. Finding areas of weakness that have the greatest campus interest and potential for "buy in."

Organizational Structure

The institution developed an organizational structure that would most efficiently and effectively accomplish the goal of developing a QEP that would address the major concerns noted above and that would have broad-based campus involvement. The QEP Committee was chaired by the director of planning. The Compliance Committee was chaired by the director of institutional research. This structure permitted the development of the QEP and the compliance report to occur simultaneously. Both of these action committees reported to the Leadership Committee that included the president, the provost, the associate vice president for academic affairs/SACS liason, the vice president for financial affairs, the director of institutional research, and the director of planning, and the student government president. The QEP committee included broad representation across the University. The QEP committee kept the University informed and involved in the QEP development processes through direct correspondence, a website, meetings, focus groups, and a newly developed online database to collect unit and individual plans for improvement. A large representative steering committee also served as conduit for keeping the University informed and involved in the process.

TTU SACS Committee Structure

(See Appendices A through D for information about committee membership)

QEP Committee

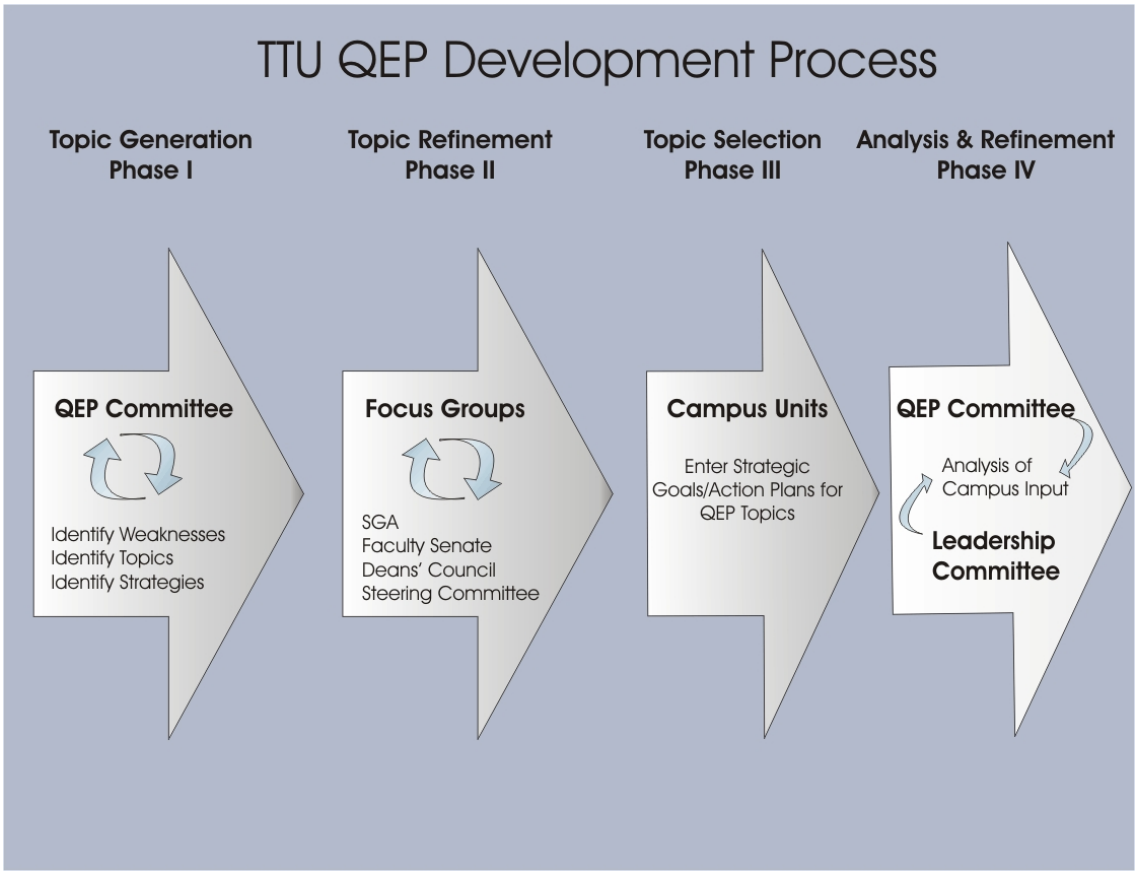
The QEP committee consisted of 10 individuals. Seven of the committee members were faculty members representing each of the major academic divisions on campus. Many of these faculty members were recognized by their peers for outstanding contributions to innovative teaching and/or service. The committee also included two graduate students who also received their undergraduate degrees from TTU. The committee was chaired by Dr. Barry Stein, director of planning and professor of psychology. Dr. Stein also serves as the concentration leader for the Ph.D. program in Program Planning and Evaluation.

The primary functions of the QEP committee are described below.

1. To identify areas of weakness in student learning that are obstacles to students' life-long success (using available assessment data).
2. To suggest potential areas of focus and possible strategies that could positively impact these areas of weakness and help insure students' life-long success with broad "buy in" across the University.
3. To suggest strategies for increasing campus involvement in improvement efforts.

Development Phases

To accomplish these tasks efficiently, the QEP development process involved four phases.



Phase I

The QEP subcommittee identified weaknesses that would impact the life-long success of students by examining an extensive collection of assessment data on our students. These data included teaching evaluations, student ratings of progress on different learning objectives, enrolled student surveys, employer surveys, alumni surveys, and test performance on national and locally developed instruments. This analysis helped the committee identify six potential areas for a QEP focus that could be addressed by most units on campus. The committee also identified what it thought might be possible strategies that units could use to improve student performance in these areas. A review of the various types of assessment data that the committee reviewed is provided below.

Analysis of Teaching Evaluations

TTU uses the IDEA teaching evaluation system that was developed at Kansas State University as the required course evaluation system. This system allows for flexibility in how courses are evaluated by permitting instructors to select from a set of 12 learning goals that are summarized below.

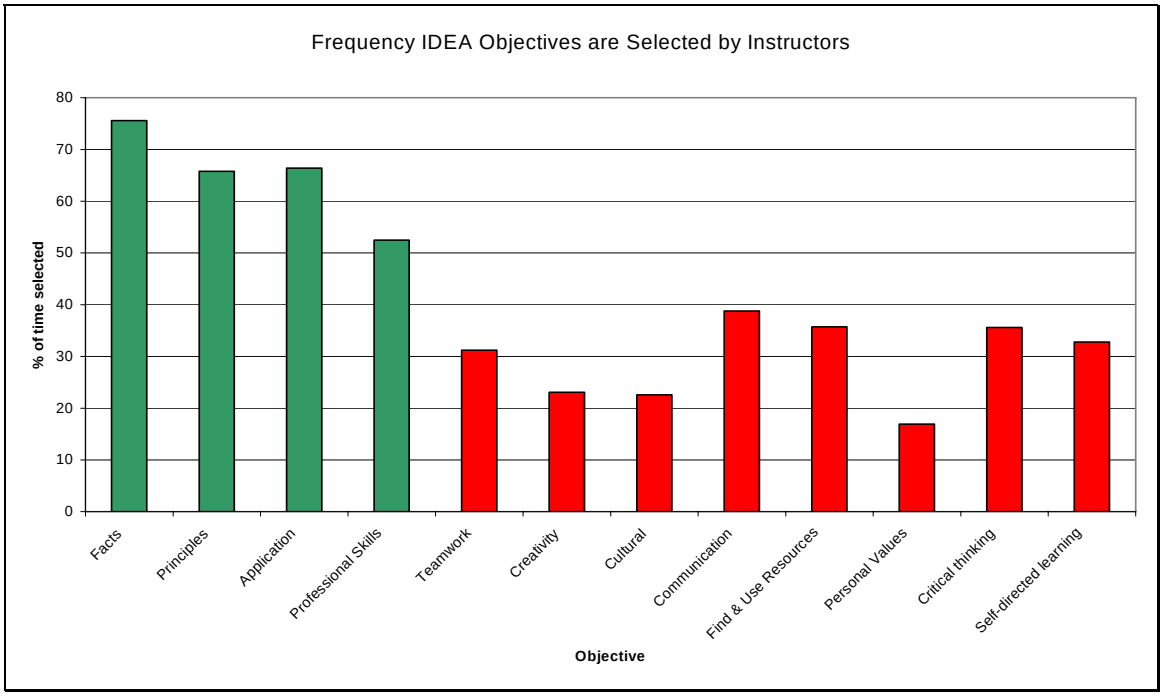
- Gaining factual knowledge
- Learning fundamental principles, generalizations, or theories
- Learning to apply course material
- Developing specific skills or competencies needed by professionals in this field

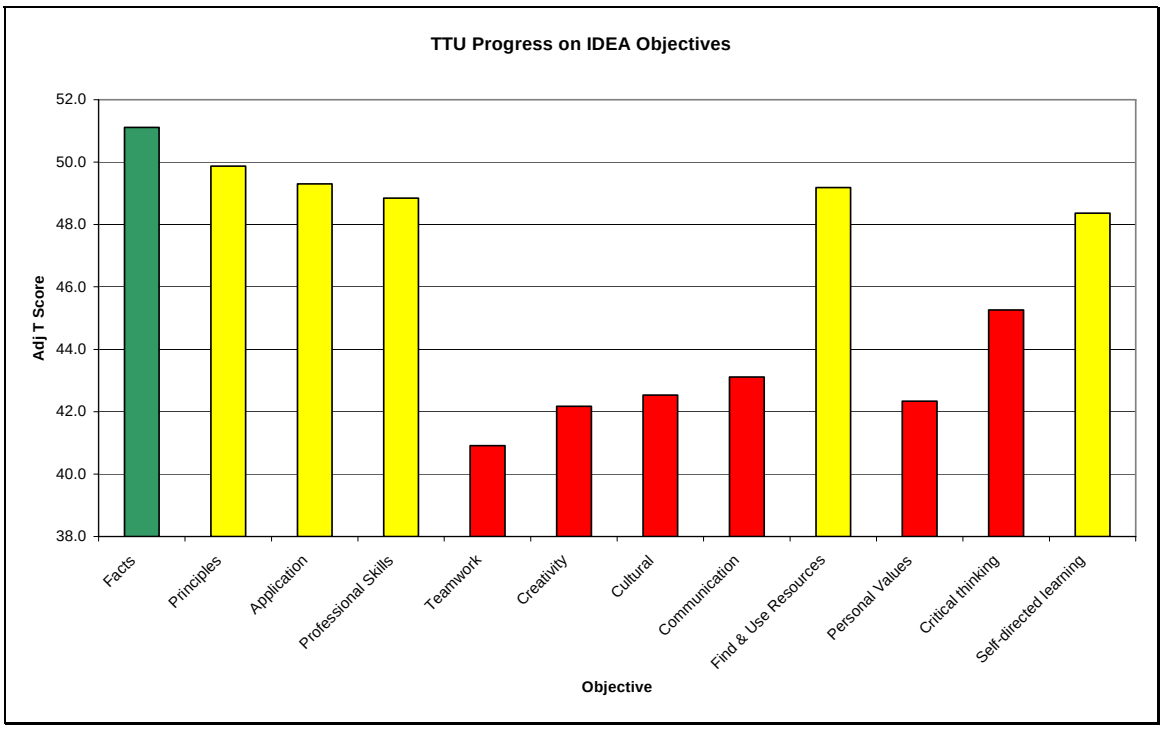
- Acquiring skills in working with others as a member of a team
- Developing creative capacities
- Gaining a broader understanding and appreciation of intellectual/cultural activity
- Developing skill in expressing oneself orally or in writing
- Learning how to find and use resources for answering questions or solving problems
- Developing a clearer understanding of, and commitment to, personal values
- Learning to analyze and critically evaluate ideas
- Acquiring an interest in learning more by asking questions and seeking answers

Students evaluate their progress on each of these goals, but instructors only receive feedback on the goals they have identified as important or essential to the course (essential goals are weighted twice as much as important goals). TTU has been tracking institutional performance on these evaluations since 1994 and regularly posts analyses of these data on our website. The IDEA evaluation system can provide two useful types of assessment information.

- Information about how frequently different teaching goals are selected.
- Information about how much progress students think they are making on each goal.

The graphs below illustrate institutional patterns over a four year period related to each of these measures. Discipline breakdowns have been posted on our website for units to use in developing unit specific plans.

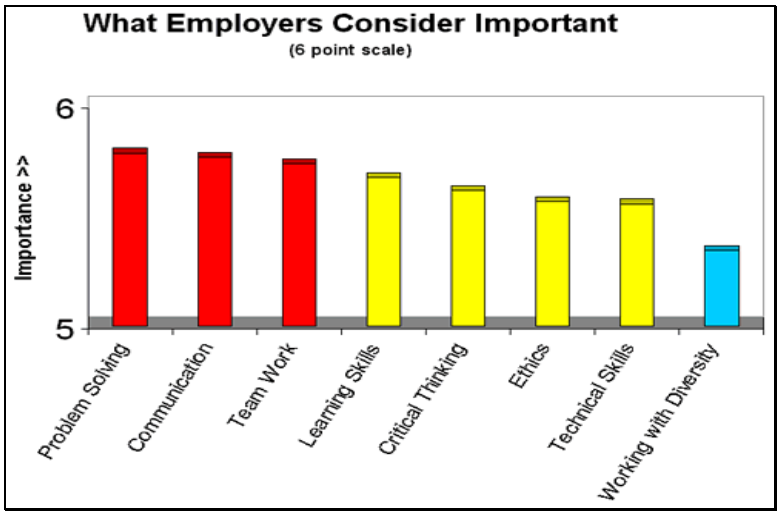


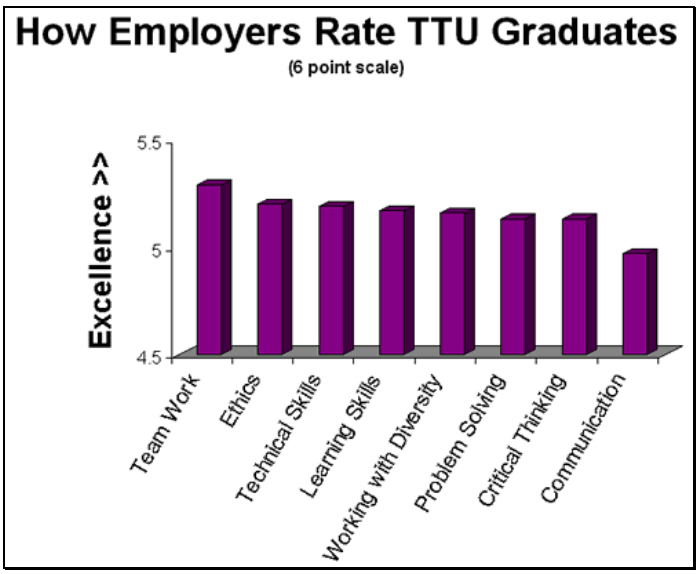


These graphs show that TTU instructors tend to emphasize the acquisition of factual knowledge in their classes and that student progress on various course goals is highest (and only above the national average) in acquiring factual knowledge. Other areas that may be crucial for students' life-long success (e.g., teamwork, creativity, communication skills, critical thinking, and other activities that underlie life-long learning) either receive little emphasis in courses being evaluated or show relatively low levels of student progress.

Employer Survey

A 2003 survey of employers sought to identify those areas that are most important to our students' employers and to gather information about how our students perform in each of those areas. The figures below illustrate the findings of this survey.





The five most important skill areas for our employers are listed below.

- Problem solving
- Communication
- Teamwork
- Learning skills
- Critical thinking

The three areas where our students seem to score lowest are listed below.

- Communication
- Critical thinking
- Problem solving

Enrolled Student Surveys and Alumni Surveys

Recent TTU enrolled student surveys (2004) and alumni surveys (2005) revealed few weaknesses other than in the area of cultural experiences. Since TTU has already put into place a program designed to improve students' cultural experiences (Center Stage), this topic was not considered appropriate for a SACS Quality Enhancement Plan.

In addition to the normal Tennessee Higher Education Commission (THEC) enrolled student survey that is administered every three years, a recent administration of the National Survey of Student Engagement (NSSE) provided additional assessment information during the QEP development process. Although this information was not initially available when the QEP committee analyzed weaknesses and formulated ideas, the results are consistent with some of the other assessment results. Weaknesses were identified in the following areas:

- Students reported courses emphasized memorization and rote retention of factual information significantly more often than is true of comparable institutions nationally

(These findings are negatively related to an emphasis on critical thinking, real-world problem solving, and active learning.).

- The institutional contribution to effective communication skills was lower than the national average.
- The institutional contribution to helping students contribute to the welfare of their community was significantly below the national average (These findings are negatively related to the use of active learning strategies such as service learning.).

Student Performance on General Education and Critical Thinking Tests

TTU has been evaluating and developing an instrument to assess critical thinking as part of a state-wide performance funding initiative. An NSF grant to expand our collaboration with other universities in the refinement of the CAT (Critical-thinking Assessment Test) instrument has also given us the opportunity to compare our students' performance with that of other students across the country. We have also administered a variety of other assessments to evaluate our students' critical thinking skills. These assessment opportunities have suggested the following weaknesses in TTU students:

- Performance on the ETS Academic Profile Test revealed 68% of senior-level students tested were not proficient in the area of critical thinking.
- Performance on our own CAT instrument averages about 53% of the total possible points that our own faculty identify as important components of critical thinking needed by graduates.
- Performance on our own CAT instrument is below that observed for three other institutions that administered the CAT recently.

Informal Faculty Observations

Faculty members on the QEP committee and elsewhere at the University have also shared their own observations about student weaknesses. While these anecdotal observations were not the result of systematic efforts to collect data, they do represent qualitative experiences that are common in academia across many disciplines.

- Students frequently have trouble transferring knowledge to novel problem solving tasks.
- Students often fail to critically evaluate information.
- Students often seem to be unprepared to deal with complex real-world problems.
- Students have a difficult time developing creative approaches to new problems.

Possible Topics Identified

The analysis of available assessment data led the QEP committee to identify six possible areas for the improvement of student learning that could positively affect their life-long success:

- Improve communication skills
- Improve teamwork skills
- Improve creative thinking skills
- Improve real-world problem solving skills

- Improve critical thinking skills
- Improve life-long learning skills

Identification of Possible Strategies

The QEP committee also identified a variety of strategies that could be used to enhance student learning in the areas identified above using pedagogical approaches that involve active learning strategies. This list was not intended to be exhaustive but to provide some examples of the ways in which faculty could encourage skill development in these areas. The table below provides a summary of the QEP committee's initial recommendations for topics and strategies. Throughout the discussions of these topics, the committee recognized that there was considerable overlap among these topics. For example, critical thinking skills, real-world problem solving skills, and life-long learning skills overlap considerably with each other. Topic areas such as improving teamwork skills, improving communication skills, and improving creative thinking represent potentially more diverse skills, but include skills that are often needed to support real-world problem solving. For example, real-world problem solving often involves working in teams and communicating effectively.

The committee realized that broader campus input was needed to find the most compelling way to narrow the focus for the QEP – a focus that would maximize campus involvement. Broader campus input was sought in Phase II.

Initial List of QEP Topics and Strategies

QEP Topic	Possible Strategies	Benefits if successful
Improve communication skills	Projects that involve written or oral presentations, co-ops, service learning, debates, student ambassadors, professional presentations, effectively using technology, professional development for alumni, collaborative learning, and create a campus culture where communication is important	Improved career success, improved retention, improved student engagement, improved confidence
Improve teamwork skills	Co-ops, real-world projects involving teams, service learning, debates, collaborative learning, and create a campus culture where teamwork is important	Improved career success, improved retention, improved student engagement, improved confidence
Improve creative thinking skills	Real-world problem solving projects, original research, service learning, using technology effectively, using information technology effectively, collaborative learning, and create a campus culture where creative thinking is important	Improved career success, improved retention, improved student engagement, improved confidence
Improve real-world problem solving skills	Co-ops, real-world problem solving projects, service learning, simulations, case studies, using technology effectively, using information technology effectively, alumni mentoring, collaborative learning, and create a campus culture where problem solving is important	Improved career success, improved retention, improved student engagement, improved confidence
Improve critical thinking skills	Real-world projects, case studies, original research, simulations, using technology effectively, using information technology effectively, debates, role playing, collaborative learning, seeing other points of view, and create a campus culture where critical thinking is important	Improved career success, improved retention, improved student engagement, improved confidence
Improve life-long learning skills	Real-world projects, original research, co-ops, case studies, simulations, using technology effectively, using information technology effectively, alumni mentoring, collaborative learning, and create a campus culture where independent learning is important	Improved career success, improved retention, improved student engagement, improved confidence

Phase II

The chairperson of the QEP subcommittee conducted various focus groups with the Faculty Senate, Student Government Association, Deans' Council and SACS Steering Committee to explore two issues.

1. To determine if worthy topics for a QEP had been overlooked.
2. To determine which of the identified topics had the greatest interest among faculty and students.

These focus groups were used to help identify areas where we could expect to see the greatest campus involvement and commitment. As a result of these focus groups, we were able to establish that the committee had identified an assortment of the most significant topics of concern for both faculty and students that were appropriate for a QEP. Furthermore, the greatest faculty interest appeared to be in the area of improving critical thinking skills, while the greatest student interest was in the area of improving real-world problem solving skills. Secondary areas of interest that complemented these primary choices included improving communication skills, improving teamwork skills, improving creative thinking skills, and improving life-long learning skills.

As noted earlier, the committee recognized that there was considerable overlap among the topics and that some sort of synthesis would be required to achieve the broadest possible campus participation. There were two major objectives that guided the use of the focus group data to narrow the focus for the QEP:

- Maximize campus involvement
- Create a focus that is theoretically sound and unified

These objectives were achieved by combining the first choices for faculty and students. Indeed, TTU's own efforts to develop a test of critical thinking that had high face validity for our faculty included both critical thinking and real-world problem solving tasks.

Primary focus of the QEP:

Improve critical thinking/real-world problem solving skills through the use of active learning strategies.

The fact that many real-world problems involve thinking creatively, working in teams, and effectively communicating ideas led us to add these additional areas of emphasis as means to broaden campus participation without altering the focus of the QEP.

Additional areas of emphasis for the QEP:

Improve critical thinking/real-world problem solving skills through the use of active learning strategies.

- with emphasis on communication skills
- with emphasis on teamwork skills
- with emphasis on creative thinking

The information gathered in Phase III would help us determine if these additional areas of emphasis served to broaden campus involvement and were necessary.

Phase III

In phase III an analog to our existing web-based Institutional Effectiveness System was constructed for gathering more detailed input from all academic planning units across the campus. The system design was virtually identical to the existing system that is used to collect and organize strategic plans

and outcomes for each planning unit on campus. This design was intentional and served two purposes:

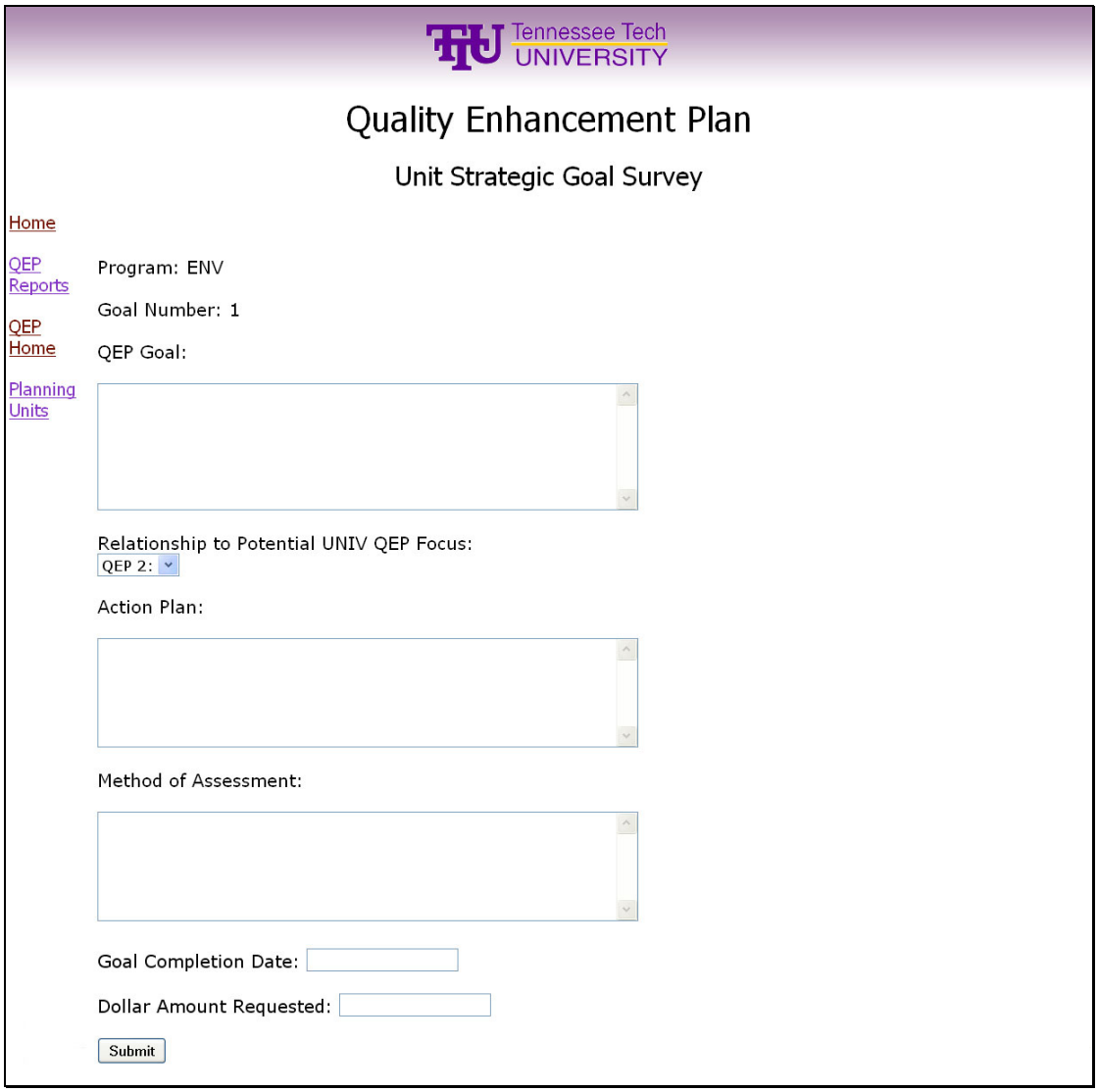
1. Units would be familiar with the web interface and the type of information that is entered.
2. Information entered into the system could be copied into each unit's strategic plan (within the existing Institutional Effectiveness System) once the QEP is approved by SACS.

Information about the QEP topic, potential strategies that could be used to address the topic, examples of possible assessment measures, and guidelines for submitting unit proposals were posted on the our QEP website. This website also included a link to the electronic database that was constructed for the purpose of gathering information from each unit.

Units were requested to propose possible strategies, action plans, and assessment measures that they could use to address the QEP topic with or without the additional areas of emphasis that had emerged from the focus group discussions. To encourage meaningful dialog and the pursuit of worthwhile strategies, each unit was allowed to request up to $3000 to assist in implementing one or more of their plans.

Unit leaders were also encouraged to use the system to access other unit plans (A report function is built into the system.) so that they could explore cooperative interdisciplinary proposals.

Example of User Interface for Entering QEP Unit Plans



Phase IV

The information entered into the QEP online data base system was analyzed and discussed by the QEP committee. The plans varied considerably across units. While some units submitted proposals to educate their faculty about innovative pedagogical techniques for active learning that could enhance critical thinking and real-world problem solving, other units submitted proposals to actually implement specific strategies to improve these areas of student learning. The diversity of plans demonstrated that some areas of campus were ready to act on specific strategies to improve student learning on the QEP topic while other areas needed to provide faculty development experiences that would educate the faculty about active learning strategies that could be used in their disciplines to improve critical thinking and real-world problem solving.

The QEP committee also made several additional observations about the proposals submitted that would have implications for modifying and refining the University's QEP. Specifically, two important conclusions were drawn from the analysis of unit plans:

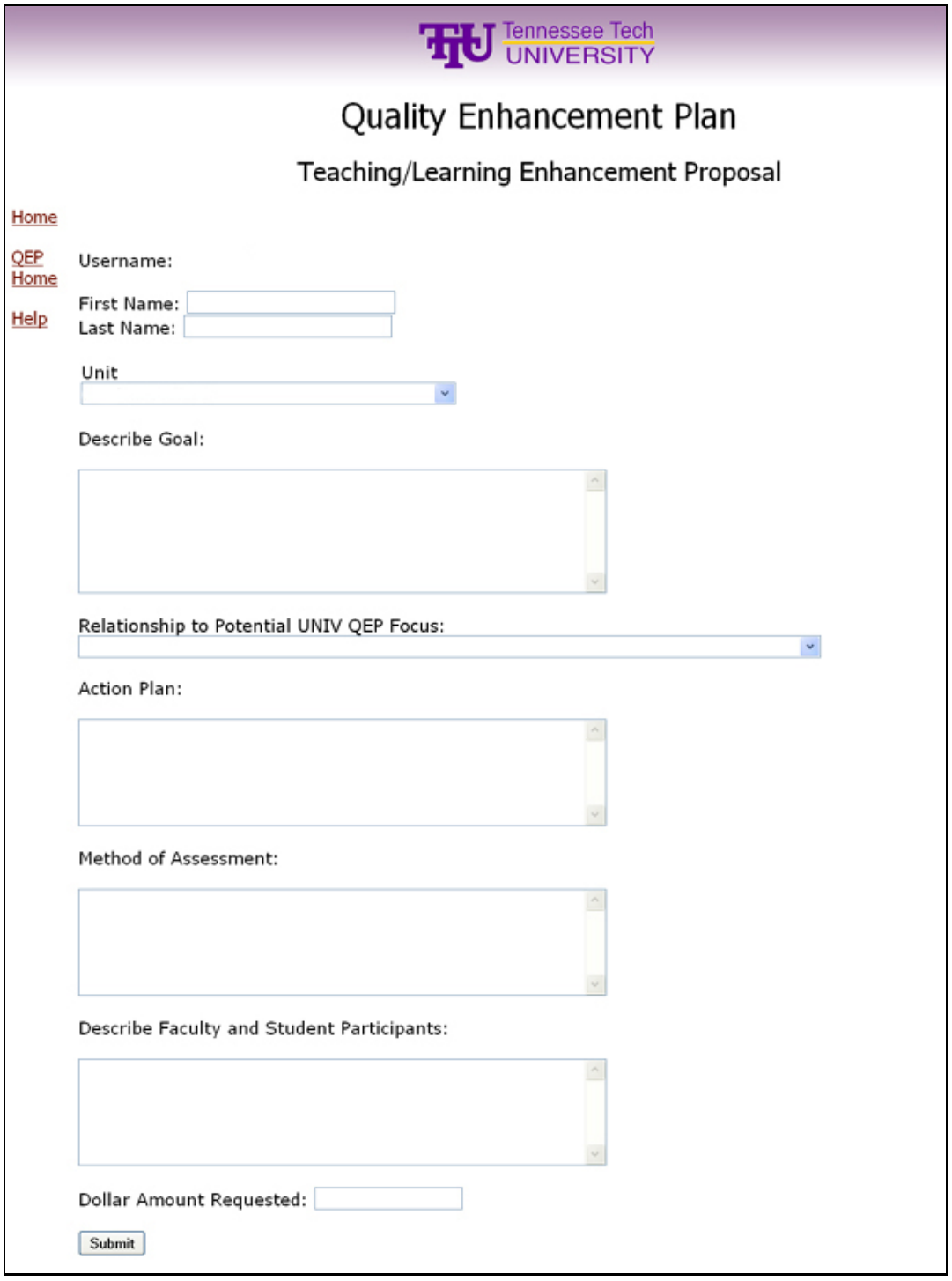
- The three areas of emphasis (communication, teamwork, creative thinking) did appear to broaden campus involvement.
- There was a need to more fully engage individual faculty in developing plans to support the QEP.

While some units entered plans that the QEP committee considered worthwhile, other units entered plans that were either vague or did not clearly involve specific faculty. Consequently, the QEP committee developed several additional strategies to more fully engage the campus in efforts to address the QEP that were supported by the Leadership Committee.

1. Units were encouraged to modify and improve their proposals.
2. Individual faculty/staff would be encouraged to submit proposals for Teaching/Learning Enhancement Grants to address the QEP.
3. Individual faculty would be encouraged to submit examples of best practices related to the QEP topic that they had already used and that they were willing to share with other faculty.
4. Members of the QEP committee would provide assistance to other faculty in developing proposals.

To facilitate the process of collecting ideas for Teaching/Learning Enhancement Grants to address the QEP, a modified version of the Unit QEP Strategic Goal Survey System was quickly developed and implemented with the help of ITS staff. This system allowed individual faculty to enter and edit proposals for Teaching/Learning Enhancement Grants related to the QEP. Detailed instructions and examples were also provided to help facilitate the application process.

Example of User Interface for Entering Individual Plans for Teaching/learning Enhancement Grants



The efforts to solicit proposals from individual faculty/staff greatly increased the pool of valuable ideas and strategies and more fully engaged the campus in the QEP. At the time this document was prepared, over 100 proposals had been submitted by units and individual faculty/staff across the

University. The QEP committee will review all proposals after the SACS site visit and provide formative and summative feedback on each proposal to strengthen plans that are funded in the first year and to stimulate the preparation of high quality proposals in the following years.

Funded proposals will be featured on our QEP website and publicized to increase campus interest in the QEP and to provide examples of innovative strategies that others may want to pursue. These publicity efforts will also help create a campus culture that values the use of active learning strategies to improve students' critical thinking/real-world problem solving skills.

Campus Review of Quality Enhancement Plan

A draft of the Quality Enhancement Plan was placed on our QEP website for campus review and comment. Members of the QEP committee, Steering Committee, Leadership Committee, Faculty Senate, Student Government Association, and the campus at large were invited to review the proposal and submit suggestions and comments. Campus input on the plan was also requested via email. The comments and suggestions received were used to strengthen and improve the proposal.

Supporting Research

"Ninety-five percent of all American faculty in American universities believe that developing the powers of critical thinking of their students is not just a, but <u>the</u>, most important objective of a college education." – Derek Bok

(President Emeritus, Harvard University, Invited Address, 2005 SACS/COC meeting)

Importance of the Topic

The quotation above was delivered at the opening general session at the 2005 SACS/COC meeting in Atlanta. It is not surprising that critical thinking was the third most frequently selected topic for Quality Enhancement Plans in a recent SACS report. However, the importance of critical thinking in education was recognized long before the advent of quality enhancement plans. We could trace the foundations of critical thinking back to ancient Greek philosophers like Socrates and Plato, and certainly back to pioneers in American educational philosophy such as John Dewey (e.g., 1910). Many contemporary educators have also noted the importance of preparing people to think critically (e.g., Bloom, 1956; Bransford, Brown, & Cocking, 2000; Ennis, 1985; Paul & Nosich, 1992; Pawlowski & Danielson, 1998; Resnick, 1987; Siegal, 1988; Vygotsky, 1986).

In addition to educators, federal and state governments have taken an interest in critical thinking. For example, in 1990 the U.S. Department of Education stated, "the proportion of college graduates who demonstrate an advanced ability to think critically, communicate effectively, and solve problems will increase substantially" (Facione, Facione, Sanchez, & Gainen, 1995: 2). This goal became part of the "Goals 2000: Educate America Act" passed by Congress (U.S Congress, 1994).

Numerous educational agencies and accrediting organizations have also emphasized the importance of critical thinking. The National Institute of Education (1984) and the Association of American Colleges (1985) both strongly encourage an emphasis on the teaching of critical thinking skills in higher education institutions. Accrediting agencies such as the Association to Advance Collegiate Schools of Business (AACSB), the National Council for Accreditation of Teacher Education (NCATE) also acknowledge the importance of critical thinking skills in their respective accreditation standards (AACSB International, 2005; NCATE, 2002).

Although critical thinking is an essential element to lifelong learning, many experts concur that college students lack advanced critical thinking skills. "Critical thinking is often seen as a universal goal of education but is seldom confirmed as an outcome" (Burbach, Matkin, & Fritz, 2004, 1; see also Bok, 2005).

What is Critical Thinking?

Critical thinking is defined differently by many professionals. One reason for these differences is that the concept of critical thinking has evolved over many years and across a variety of disciplines. Recently, Petress (2004) examined a plethora of definitions for "critical thinking" and concluded that although many explanations share common characteristics, there are significant variations across disciplines (see also Aretz, Bolen, & Devereux, 1997). While some professionals define critical thinking narrowly in terms of either evaluating information, conclusions, or arguments, others view critical thinking more broadly and comprehensively. For example, many consider critical thinking to

underlie the effective application of knowledge to real-world problems and to underlie independent life-long learning (Halpern, 1993; MacPhail-Wilcox, Dreyden, Eason, 1990; Paul, 1993; Tsui, 2002).

Many professionals view critical thinking, learning, problem solving, creative thinking, and effective communication as an interrelated set of higher-order thinking skills that are often implicated in real-world tasks (Anderson, 1980 ; Bransford & Stein, 1993; Halpern, 1993; Hayes, 1989; Jih, 2003; Rubinstein & Pfeiffer, 1980). Indeed, many faculty adopt a rather broad view of critical thinking that includes many of the previously mentioned skills. For example, a recent attempt to find areas of agreement in what skills underlie critical thinking found that approximatedly 80% or more of faculty surveyed across disciplines and institutions thought each of the following 12 skills were valid components of critical thinking (Stein, Haynes, & Ennis, 2005):

Skills Considered Valid Components of Critical Thinking

- Separate factual information from inferences that might be used to interpret those facts.
- Identify inappropriate conclusions.
- Understand the limitations of correlational data.
- Identify evidence that might support or contradict a hypothesis.
- Identify new information that is needed to draw conclusions.
- Separate relevant from irrelevant information when solving a problem.
- Learn and understand complex relationships in an unfamiliar domain.
- Interpret numerical relationships in graphs and separate those relationships from inferences.
- Use mathematical skills in the context of solving a larger real-world problem.
- Analyze and integrate information from separate sources to solve a complex problem.
- Recognize how new information might change the solution to a problem.
- Communicate critical analyses and problem solutions effectively.

These findings suggest that faculty view critical thinking as a collection of higher order thinking skills, some of which represent a narrow focus of what is considered critical thinking (e.g., evaluating and interpreting information, conclusions, theories and other points of view), while others involve skills such as learning new information, solving complex real-world problems, thinking creatively, and communicating effectively.

Critical Thinking and Life-long Success

Critical thinking (broadly defined) is increasingly regarded as an important determinant of success in many areas life. For example, Halpern (1993: 251) argues “virtually every business or industry position that involves responsibility and action in the face of uncertainty would benefit if the people filling that position obtained a high level of the ability to think critically” (see also Duchesne, 1996). Braun (2004) also notes that critical thinking is essential in decision-making, using as an example the poor ethical choices made by executives in the Enron scandal.

A recent employer survey prepared by Rutgers University for the New Jersey Higher Education Commission (2005) revealed that employers of bachelor graduates consider critical thinking and problem solving to be two of the five most important factors for success in employment. Yet, “Less than half of the employers believe that recent graduates are prepared in the areas of analytic skills, including critical thinking, judgment and decision-making and problem solving” (Rutgers, 2005).

Not only do students need critical thinking skills for success in their future careers, students also need these skills in order to make sound choices and wise, life-altering decisions about life and their roles

in societies (Brophy, Hodge, & Bransford, 2004; Tsui, 2002). The ability to employ effective critical thinking strategies is a fundamental quality of a good citizen. Effective critical thinking helps to keep the mind free of prejudices, hate, and inappropriate attitudes (Paul, 1993). Critical thinking skills are also essential to becoming a responsible consumer of information.

Active Learning Strategies to Support Critical Thinking/Real-World Problem Solving Skills

There is general agreement among those who conduct basic research in learning sciences that the context in which learning occurs has a strong influence on how any resulting knowledge can be used and how easily it can be transferred and applied to other situations. The more closely the learning environment resembles the application environment, the greater the likelihood of successful transfer (Bransford et. al., 2000; Jenkins, 1978 ; Stein, 1989). If we want students to critically evaluate information and ideas, communicate effectively, think creatively, and solve real-world problems, then our educational environments must resemble the application situations in which those skills are going to be used. The term "active learning" is often used to describe a broad category of educational strategies that seek to embed learning in situations that require the student to engage in analytical thinking, application of information, and/or some type of problem solving. Active learning strategies can be contrasted with lecture-based learning in which the student is a passive recipient of information. The latter approaches often produce what Whitehead (1929) called "inert knowledge," information that students are able to recall in rote retention tasks but that cannot be applied spontaneously to solve problems (see also Simon, 1980).

Active learning has been found to have a positive influence on students and instructors in many disciplines (Braun, 2004; Burbach, Matkin, & Fritz, 2004; Udovic, Morris, Dickman, Postlethwait, & Wetherwax, 2002). The use of active learning strategies to improve critical thinking has a positive effect on student motivation (Cheung, Rudowicz, Kwan, & Yue, 2002). Improvements in student motivation can positively affect retention and graduation rates.

The QEP committee identified a variety of active learning strategies that could be used to enhance critical thinking and real-world problem solving. Many of these ideas have been the subject of extensive research. The discussion below briefly reviews some of this research.

Problem-Based Learning, Simulations, Case-Based Learning, Service Learning

One obvious strategy that educators have pursued to develop effective active learning environments is to create opportunities for learning involving real-world problem solving tasks. The approaches identified here (problem-based learning, simulations, case-based learning, and service learning) may vary in the authenticity of the problem serving as an anchor for instruction, but they all seek to encourage learning in the context of solving realistic problems. Students who have the opportunity to learn in the context of working on real-world problems are better able to make connections between textbook/classroom experience and real-world experiences (Marsden, 1994; Muir, 1996; Roever, 1998). Research has also shown that students react positively to real-world simulation techniques which require higher-order thinking skills (Springer & Borthick, 2004). Problem-based learning also appears to enhance the development of critical thinking and problem solving skills (Brandon & Majumdar, 1997; Gonzales & Nelson, 2005).

Case-based learning is frequently used in business and clinical/health care education, but could also be adapted to many other fields. Case-based learning seeks to develop critical thinking and problem

solving skills in the context of working on specific real-world cases in the appropriate field. "The advantages of the CBL method are numerous and are directly related to skills employers indicate professionals need in the future" (Rodgers, Cross, Tanenbaum, & Tilson, 1997, p. 257).

Service learning is another tool that is used to create more opportunities for active learning and the application of classroom learning to real world situations. Service learning has been found to improve students' ability to apply what they have learned in the real world (Balazadeh, 1996; Cohen & Kinsey 1994; Eyler & Giles, 1999; Fenzel & Leary, 1997; Foreman, 1996; Gray, et al., 1998; Juhn, Tang, Piessens, Grant, Johnson, & Murray, 1999; Kendrick, 1996; Markus, Howard, & King, 1993; McMahon, 1998; Miller, 1994;
Nigro & Wortham, 1998; Oliver, 1997). Service-learning participation has also been found to have a positive impact on problem solving and critical thinking (Batchelder & Root, 1994; Eyler & Giles, 1999; Eyler, Root, & Giles, 1998; Osborne, Hammerich, & Hensley, 1998). There is also evidence that service learning improves student satisfaction with college (Astin & Sax, 1998; Berson & Younkin, 1998; Gray, et al., 1998) and the likelihood of graduation (Astin & Sax, 1998).

Creative Thinking

Successful real-world problem solving frequently involves finding a solution that is novel or original. If we only prepare our students to solve problems using previously known solutions, we will limit their opportunities for success. Efforts to involve students in real-world problem solving must also encourage creative thinking. Creative thinking and critical thinking are frequently seen as interrelated skills (Johnson & Johnson, 1993; Paul, 1993). The ability to see and understand other points of view is necessary for both critical and creative thinking. It is not surprising that both critical and creative thinking are important factors in innovation (Brophy, Hodge, & Bransford, 2004).

Communication Activities

Many real-world problems ultimately depend on effective communication as a part of their solution. In many cases success or failure hinges on being able to effectively communicate. For example, no matter how good an invention is, it will have little impact if the idea can not be effectively communicated to others. It is not surprising that employers frequently rate communication skills as one of the most important elements of career success (Rutgers, 2005).

Communication activities have also been used in educational settings to improve critical thinking skills. One potential benefit of writing/communication activities is that such activities can encourage students to critically examine others' ideas or to reflect on their own understanding of an idea or problem. It is important to encourage students to evaluate their own understanding since this is a critical part of life-long learning.

Various types of communication activities have been used in higher education to improve critical thinking. Specific communication strategies that have been used include paper revision and classroom discussion (Tsui, 2002;), debate (Johnson & Johnson, 1993; Payne & Gainey, 2003; Pernecky, 1997), in-class reviews (Hoefler, 1994; VanWynsberghe & Cassivi, 2000), reaction papers (Jaimes, 2005), portfolios (Hoger, 1998; Ruthman, Jackson, Cluskey, Flannigan, Folse, & Bunten, 2004; Sorrell, Brown, Silva & Kohlenberg, 1997), journal writing (Collentine, 2002), and role play (Vavrina, 1993).

Calibrated Peer Review

The peer review process underlies most academic and scientific endeavors whether applying for grants, publishing scholarly articles, or progressing through tenure and promotion. The most obvious function of the peer review process is to promote quality in academic pursuits. Those who have participated in such activities know it is also clearly an exercise in critical thinking that frequently involves learning about new information or ideas. It is not surprising that peer review has been adapted for use as an active learning strategy in educational settings. One variation on peer review, Calibrated Peer Review™ (CPR) shows promise as a means of both providing students with greater opportunities to develop communication skills (without burdening instructors) and improving students' critical thinking skills (Chapman & Fiore, 2000). Developed at UCLA, the CPR system involves a computer network that provides opportunities for students to learn how to evaluate essay writing assignments through a process of calibrating their evaluations to expert evaluations of the same essay assignments. These exercises afford numerous opportunities to learn and critically evaluate ideas.

Teamwork & Collaborative Learning

Although many formal educational settings require students to work independently and measure student accomplishments individually, in most careers that our students pursue, success will depend on teamwork. It is not surprising that many employers consider teamwork to be one the most important skills for career success (Rutgers, 2005).

Teamwork can also be used to create more realistic and active learning opportunities in educational settings. Real-world problem solving often requires teamwork, and it is not surprising that extensive research has occurred to explore how teamwork can be used to enhance learning. The term "collaborative learning" is frequently used to describe active learning experiences that seek to enhance learning through teamwork. Research in this area indicates that collaborative learning can increase the ability of students to solve problems and think critically (Johnson, Johnson, & Smith, 1998). As a result of collaborative learning, students' critical thinking skills improve, their attention increases, and they are more motivated in class (Cohn, 1999; Roebuck, 1998). Students are empowered by taking control of their own learning and the learning of their fellow classmates through teamwork.

Summary of Research Findings

The review of research provides clear evidence that we have selected an important area of student learning for our QEP focus and that this focus can have important implications for the life-long success of our students. The review also establishes the strong relationship that exists between critical thinking and real-world problem solving. In addition, the review establishes the value of

using active learning strategies to improve these skills, particularly the value of strategies that emphasize effective communication, teamwork, and creative thinking.

QEP Topic

Improve critical thinking/real-world problem solving skills through the use of active learning strategies.

- with emphasis on communication skills
- with emphasis on teamwork skills
- with emphasis on creative thinking

Assessment Plan

Overview

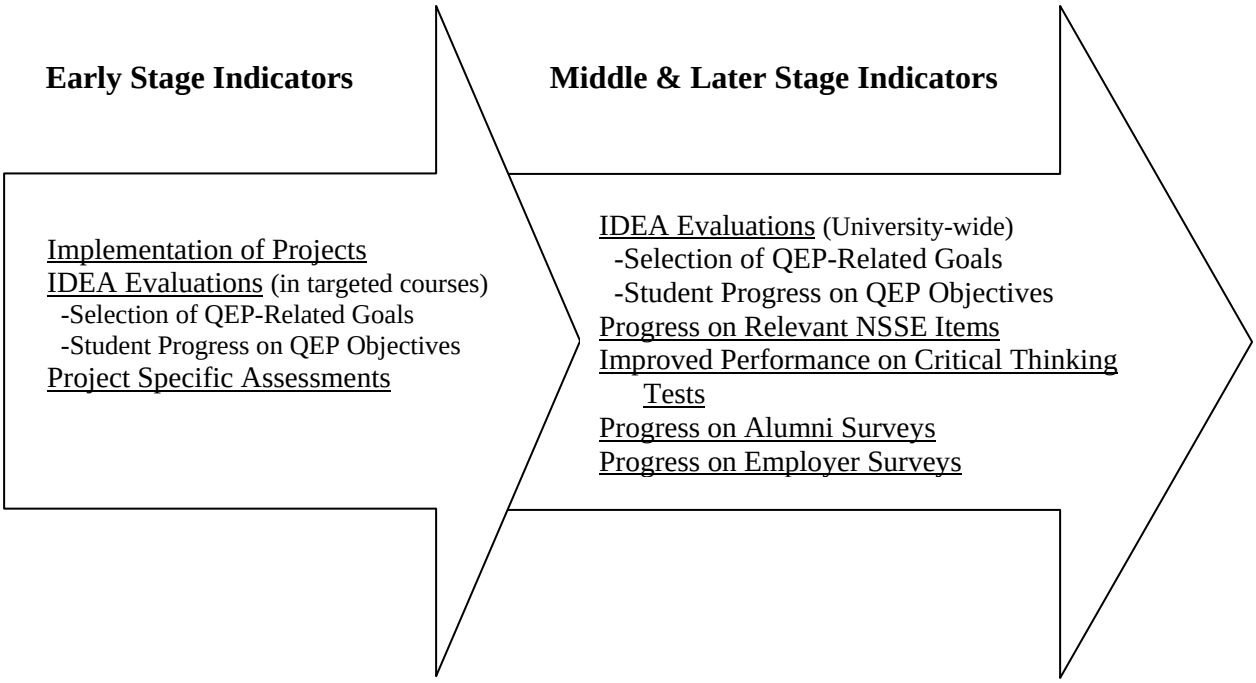
Assessing improvements in students' critical thinking/real-world problem skills is a challenging task. The difficulties associated with this assessment task stem from

1. The wide variety of skills and competencies that underlie these areas.
2. The limited availability of valid assessment tools for evaluating the wide range of skills and competencies that underlie these areas.

Although we have invested considerable effort in developing the CAT instrument for measuring these skills, the CAT instrument is only a one-hour test and does not measure all the skills that underlie effective critical thinking and real-world problem solving. Consequently, we will utilize a variety of measures that provide converging evidence to assess our efforts to improve students' critical thinking/real-world problem solving skills through the use of active learning strategies. The various assessment tools we plan to use will provide assessments in a number of key areas.

- Frequency of faculty efforts to address these goals in their courses
- Student ratings of progress on these goals in their courses
- Student ratings of involvement and institutional emphasis/contribution to these goals in the National Survey of Student Engagement (NSSE)
- Student performance on tests designed to measure critical thinking/real-world problem solving (i.e., CAT, California Critical Thinking Skills Test (CCTST))
- Relevant questions on the Alumni Survey
- Employer evaluations of graduates' skills in the areas of critical thinking, problem solving, teamwork, and communication

The indicators mentioned above will provide assessments of progress on different areas of the QEP, as well as assessments of progress at different stages of the QEP implementation. The figure below illustrates how different assessments may reveal progress at different stages of implementing the QEP.



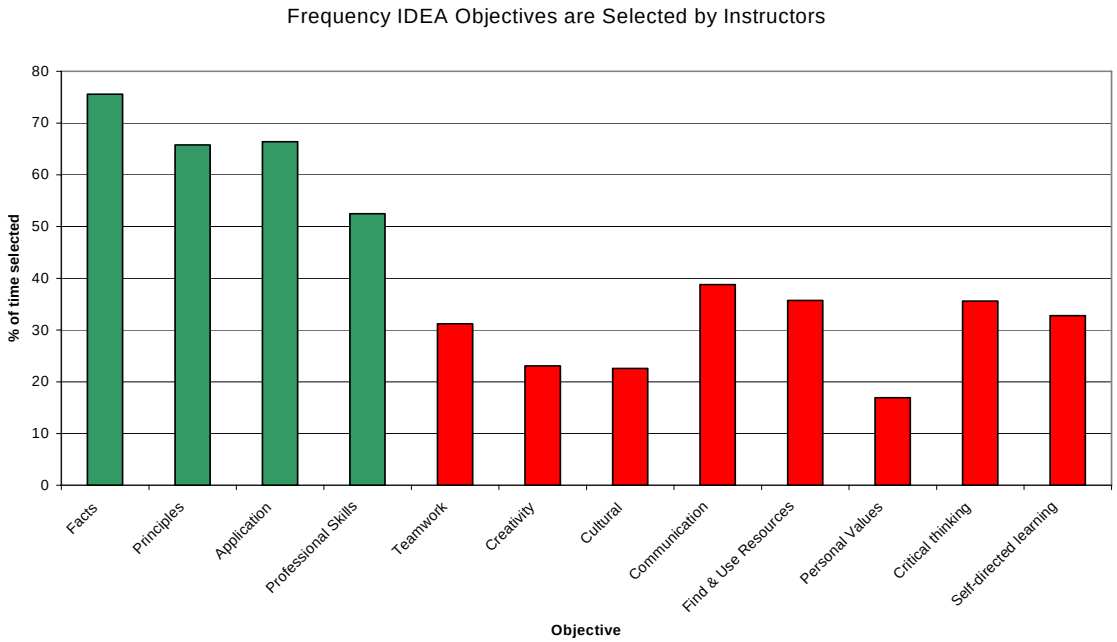
The various tools that will be used to evaluate progress on the QEP are explained below.

IDEA Teaching Evaluation Assessments

The IDEA system (Kansas State University) is one of the most widely used and researched instruments for student evaluation of teaching in the country. TTU has used this system for over 20 years and has been actively collecting and disseminating university results since 1994. The IDEA system is relatively unique in that it allows instructors to select the primary goals that they will be evaluated on in the course. There are 12 possible goals that instructors can choose from and that students use to evaluate their progress. Although these features were designed to tailor the evaluation instrument to different courses, they also provide information about what instructors are trying to accomplish in their courses as well as what progress students think they are making in various areas of learning. As such, the IDEA system can provide two types of useful information to assess progress on the QEP:

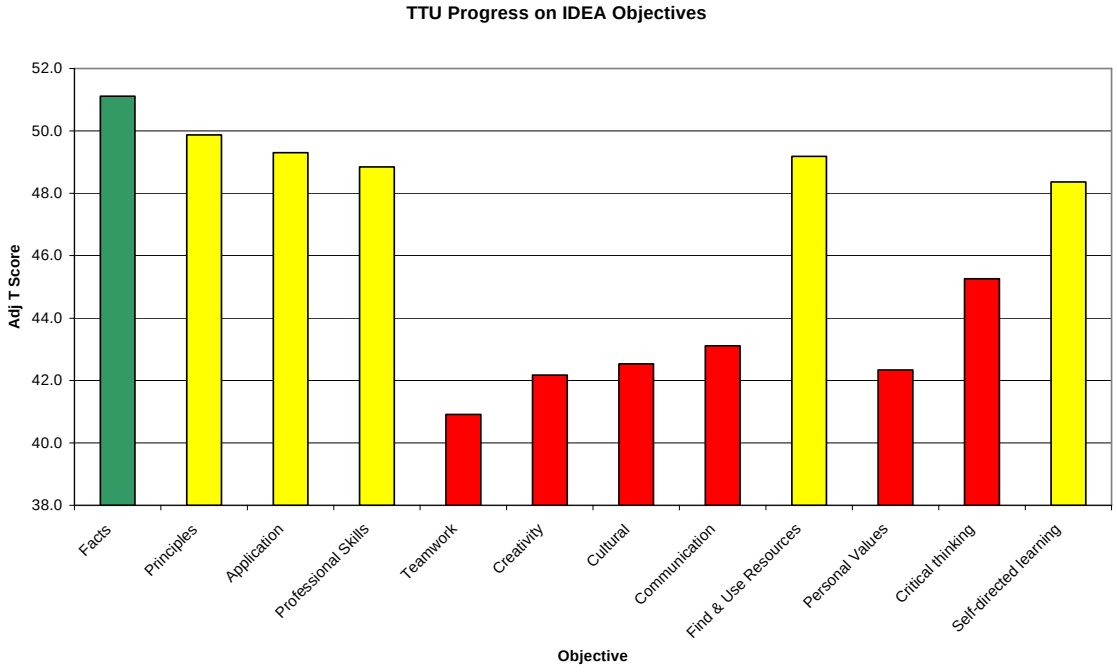
- Are instructors selecting teaching goals in the IDEA system that are relevant to the QEP more often than in the past for their classes?
- Are student ratings of progress they have made in acquiring skills related to goals that are relevant to the QEP improving?

The graph below appeared earlier in this paper and shows the frequency with which TTU faculty selected particular IDEA goals in courses over the previous four-year period. As units and individual faculty implement ideas for improving student learning on the QEP topic, we expect to see a shift in the frequency that certain goals are selected as important or essential components of courses.

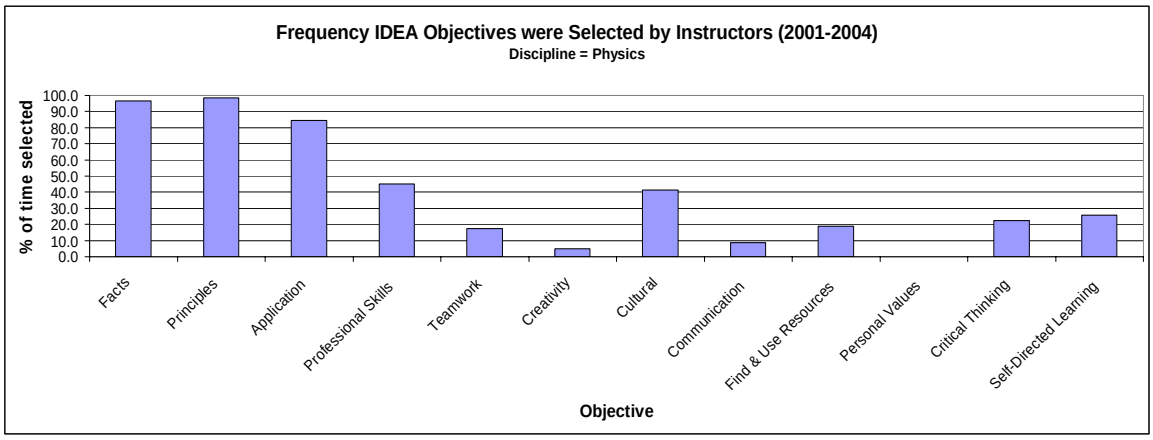


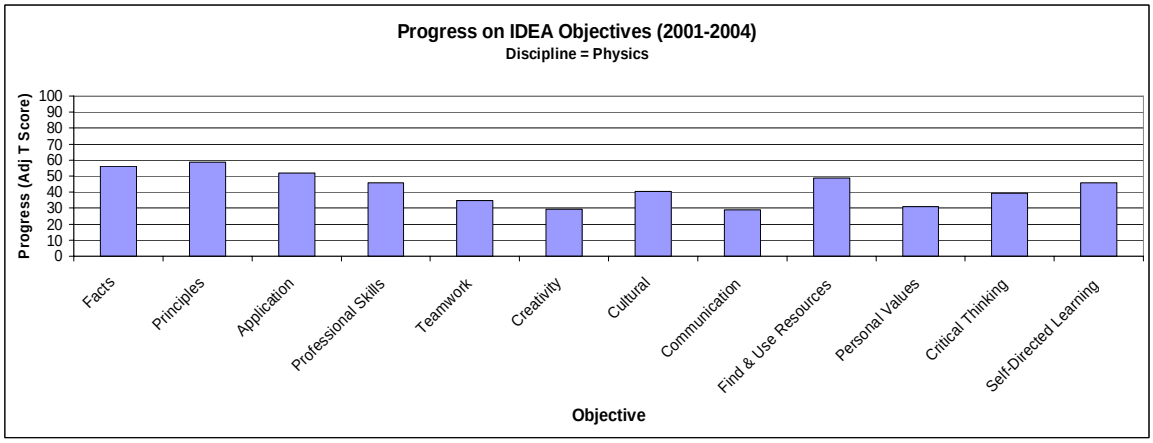
For example, the frequency that factual knowledge is selected as an important or essential goal should decline while the frequency that critical thinking, communication, teamwork, and creativity are selected as important or essential goals should increase.

The IDEA system also provides information about how much progress students think they are making on each objective. The IDEA system provides a standardized score that compares progress in each area to the national average. A T-score of 50 represents the national average. We expect to see increases in the amount of progress students are reporting in areas related to the QEP topic.



Another useful feature of the IDEA system is that progress can be evaluated at the level of individual, department, or University-wide. For example, to assess progress on an individual faculty member's QEP project, the IDEA evaluations could be compared to scores received in previous efforts to teach a particular course, by comparing scores to the national average, by comparing scores to the discipline average, or by comparing their scores to the University average. Similarly, departments can evaluate progress on their unit plans by comparing their most recent scores to previous scores, by comparing their most recent scores to national scores, or by comparing their most recent scores to the University-wide average. TTU has provided a department/discipline breakdown of IDEA scores for departments to use on our assessment website. The graphs below illustrate the data for one department.





Progress on the QEP can also be evaluated for the University as a whole by examining changes in the pattern of objective selection and progress ratings relative to the preceding time period or by comparisons with national norms.

At TTU, the IDEA system is administered in all classes taught by untenured faculty and in at least two classes taught each year by tenured faculty.

NSSE Survey

The National Survey of Student Engagement provides a variety of measures that appear to be directly relevant to our QEP topic. We plan to administer the NSSE instrument several times. The frequency and timing of the NSSE administration are determined, in part, by requirements of our governing board, the cost of administration, and recommendations of the NSSE institute. We have already administered the NSSE once to collect baseline data. The NSSE is administered to a random sample of freshmen and senior level students using a prescribed sampling procedure that is consistent for all institutions participating in the NSSE.

Specific items on the NSSE (2005 survey) that appear to be related to our QEP topic include the items in the table below. There are also other questions pertaining to students' participation in practicum and field experience as well as service activities and research projects that may also be related to the our QEP focus.

Item	Topic/Question	Relationship to QEP
	Course Work Emphasis	
2a	**Memorizing** facts, ideas to repeat in rote form	(negative) active learning, critical thinking, real-world problem solving
2b	**Analyzing** ideas, experiences, or theories	Critical thinking
2c	**Synthesizing** and organizing ideas into new more complex relationships	Problem solving
2d	**Making judgments** about the value of information, arguments, methods	Critical thinking/ Problem solving
2e	**Applying** theories or concepts to practical problems	Problem solving
	Institutional Contribution to Skills	
11c	Institution contributed to skills in writing clearly and effectively	Critical thinking/ Problem solving - Communication
11d	Institution contributed to skills in speaking clearly and effectively	Critical thinking/ Problem solving - Communication
11e	Institution contributed to skills in thinking critically and analytically	Critical thinking
11h	Institution contributed to skills in working effectively with others	Critical thinking/ Problem solving – Teamwork
11j	Institution contributed to skills in learning effectively on your own	Critical thinking/ Problem solving

Our analysis of NSSE survey data will include both comparisons to our baseline data and comparisons to national averages for similar institutions. Our goal is to show significant improvement over baseline as well as to exceed the national average for comparable institutions.

Alumni Survey

The alumni survey evaluates alumni perceptions of their college experience. This survey is used system-wide as part of the THEC Performance Funding Program. We currently have results posted for both the 2002 and 2005 years. The alumni survey appears in Appendix G. Although the survey is

designed to evaluate the general educational experience at each institution, there are specific questions related to our QEP topic. These items are identified below.

Item	Question	Relationship to QEP
9.5	Self-confidence in expressing ideas	Critical thinking/ Problem solving - Communication
9.7	Planning and carrying out projects	Critical thinking/ Problem solving
9.8	Speaking effectively	Critical thinking/ Problem solving - Communication
9.9	Writing effectively	Critical thinking/ Problem solving - Communication
9.13	Learning on your own	Critical thinking/ Problem solving
9.14	Defining and solving problems	Critical thinking/ Problem solving
9.15	Working cooperatively in a group	Critical thinking/ Problem solving – Teamwork

Our goal is to improve our scores in these areas and to score above the average for other institutions. This survey is administered every three years and is sent to all students who graduated two years before the survey administration year.

Employer Survey

The employer survey was designed at TTU with input from THEC and seeks to evaluate the priority of skills for employers and the satisfaction of employers with our students' skills in a variety of areas. The previously used employer survey appears in Appendix H. This survey assessed the importance of and level of skills in the following areas:

- Critical thinking
- Problem solving
- Communication
- Teamwork
- Life- long learning skills
- Technical skills
- Knowledge of ethical guidelines
- Ability to work with people from diverse cultural backgrounds

The next employer survey will expand upon the previously used survey and evaluate the following additional areas (as specified in current THEC Performance Funding Guidelines):

- Communication (Written & Oral)
- Work ethic
- Adaptability/Flexibility
- Potential to lead or guide others

The employer survey is administered to all employers of TTU students in our Career Center Database. These employers are asked to evaluate the quality of TTU graduates hired within the last three years. It was first administered in 2003 and will be administered in the second and fifth year of the QEP. We hope to show improvements in areas directly related to our QEP during the fifth year of the QEP.

Tests to Evaluate Critical Thinking/Real-World Problem Solving

Critical-thinking Assessment Test (CAT)

Tennessee Tech University began a pilot assessment project in 2000 to explore methods for assessing students' critical thinking skills as part of a state-wide Performance Funding Initiative. This initiative began with our attempts to use the ETS developed test Tasks in Critical Thinking. The various shortcomings of this test (e.g., low criterion validity, low scoring reliability) and the fact that it was removed from the market prompted us to examine other available tests. None of the existing tests involved faculty in the scoring of exams, and these objective exams operationally defined critical thinking in a very narrow way. These experiences created an impetus for TTU to develop its own test of critical thinking.

During the 2001-2002 academic year TTU developed and pilot tested its first critical thinking test. Three groups of faculty worked in teams and as members of a larger group to identify important critical thinking skills and develop questions/materials that would measure those skills. The test relied heavily on essay answers to help assess communication skills (as well as critical thinking skills) and leave opportunities for creative answers to questions that don't always have a single correct response. In addition, the test was based on topics that the faculty thought students would find intrinsically interesting. The latter decision derived, in part, from observations of some students' unwillingness to participate seriously in the previously administered ETS exam because they found the topics irrelevant to their interests and academic focus. The tests also involved some elements of "dynamic assessment," a procedure whereby students are given opportunities to learn and then use that newly acquired knowledge in new situations.

Key Areas/Skills Targeted for Assessment

Evaluating Information

1. Separate factual information from inferences.
2. Interpret numerical relationships in graphs.
3. Understand the limitations of correlational data.
4. Identify inappropriate conclusions.

Evaluating Ideas/Other Points of View

5. Identify & evaluate evidence for a theory.
6. Identify new information that might support or contradict a hypothesis.
7. Explain how new information can change a problem.

Learning & Problem Solving

8. Separate relevant from irrelevant information.
9. Integrate information to solve problems.
10. Learn & apply new information.
11. Use mathematical skills to solve real-world problems.

Communication

12. Communicate ideas effectively.

TTU continued to develop and refine its critical thinking test (CAT) for three years. These development activities included establishing the criterion validity of the test using other measures of academic performance and critical thinking and improving the scoring reliability. The sensitivity of the test was also evaluated through comparison of freshmen and senior level students (controlling for entering ACT scores). The test was also shown to be sensitive to a single course in critical

thinking/problem solving. Many of the early findings associated with this test were presented at concurrent sessions of the annual SACS/COC meetings during the past three years.

In the spring of 2004, TTU collaborated with the University of Memphis to administer and score the CAT instrument at the University of Memphis. The results of that collaboration were very encouraging and indicated that the questions on the CAT instrument had high face validity for faculty at another institution and that scoring reliability was relatively high (reliability = .85).

NSF Project CAT

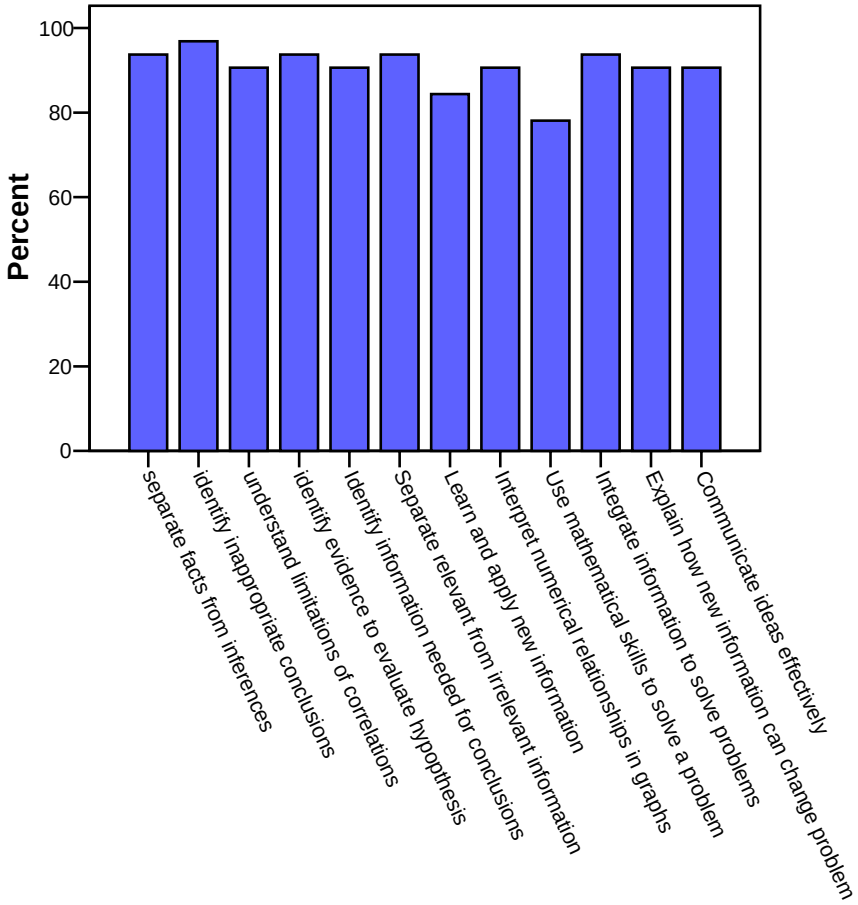
During the 2004 -2005 academic year, TTU received a National Science Foundation grant to further refine the CAT instrument with input from six other universities across the country. The three-year $499,994 NSF grant provided funding to work with six other institutions across the country to refine the CAT instrument (www.tntech.edu/cat).

- The University of Texas
- The University of Washington
- The University of Colorado
- The University of Hawaii
- The University of Southern Maine
- Howard University

During the first year of the grant TTU worked with the University of Hawaii, the University of Southern Maine, and The University of Texas to administer and score the tests using local faculty graders. These faculty members provided detailed feedback about the test and the scoring process. This information is currently being used to further refine the test and scoring guide. To date, the feedback received from other institutions has been very positive and helpful. This information is also helping refine the test so that it is ready for national distribution and use. The data collected from these institutions are summarized below.

Faculty participants in the scoring workshops were asked to indicate which of the skill areas targeted by the CAT Instrument they considered to be important components of critical thinking. Figure 2 illustrates the findings of this survey. The findings indicate that the areas of skill targeted by the CAT instrument were generally perceived as important components of critical thinking by most faculty who participated in the three scoring workshops this year.

Percent of Faculty that Identify Areas Targeted by CAT as Important Components of Critical Thinking



Correlation with Other Measures of Student Performance

Performance on the CAT instrument was correlated with other measures available for the students tested at the participating institutions including entering SAT scores and cumulative grade-point averages. The correlations provide support for the criterion validity of the CAT instrument. Entering SAT scores explained 24.9% of the variability in the CAT instrument. The magnitude of the correlation with entering SAT score is similar to findings that have been previously observed with entering ACT score, concurrent performance on the ETS Academic Profile Test, and the California Critical Thinking Skills Test (CCTST). Correlations of this magnitude are desirable because they indicate that performance on the CAT is related to other measures of academic performance, but they also indicate that the CAT instrument is measuring something different than these other assessment instruments.

Correlations (NSF Project CAT)

	SAT (verbal & math)	Cumulative Grade-point Average
CAT Score	.499 *	.337 *

* correlations significant, $p < .01$

Correlations (from prior work at TTU)

	ACT (composite)	CCTST	Academic Profile
CAT Score	.599*	.645*	.558*

* correlations significant, $p < .01$

Scoring Reliability

Student responses on the CAT instrument are scored by a minimum of two faculty graders. If those graders do not agree, the question is scored by a third grader. Scoring reliability was evaluated by examining scores assigned by faculty grader one and faculty grader two on each question. The average reliability of scoring across questions at other universities is presented in the table below. The data in the table below represent scoring reliability for faculty graders who have no prior experience grading the CAT instrument and who participated in a one-day training/scoring workshop. In comparison, the scoring reliability at TTU was (.88) when faculty with previous training and experience grading the CAT instrument were used.

Scoring Reliability

Location	Scoring Reliability
University of Hawaii	.80
University of Southern Maine	.78
University of Texas	.85

CAT Performance and NSSE Scores

A stratified random sample of 120 seniors at TTU received both the CAT instrument and the NSSE survey to evaluate the potential relationship between different types of student engagement activities and performance on the CAT instrument. Although the data is still being analyzed, preliminary findings indicate that various components of the NSSE are significantly correlated with student performance on the CAT instrument. The table below illustrates some of the NSSE questions that are related to CAT scores. The combination of NSSE questions listed below yielded a multiple regression coefficient = .426 and explained 18.1% of the variability in CAT scores, $p < .01$. These results provide additional support for the validity of the CAT instrument and indicate some potential areas where strategic initiatives might be focused to improve critical thinking performance.

NSSE Questions Related to CAT Performance (preliminary)

NSSE Question	
(1i) Put together ideas or concepts from different courses when completing assignments or during class discussions.	*
(2a) Memorizing facts, ideas, or methods from your courses and readings so you can repeat them in pretty much the same form.	(negative)**
(3b) Number of books read on your own (not assigned) for personal enjoyment or academic enrichment.	*
(7h) Culminating Senior Experience (thesis, capstone course, project, comprehensive exam, etc.)	**
(11e) Thinking critically and analytically	*

* Significant at .05 level (one tailed)
** Significant at .01 level (one tailed)

SACS/COC Presentations

TTU participated in the 2003, 2004, and 2005 annual meetings of SACS/COC by chairing round-table discussions of methods to assess critical thinking and by presenting concurrent sessions on assessing critical thinking that have reviewed the work that has been done to develop the CAT instrument. TTU is currently beginning collaborations with several SACS institutions interested in using the CAT instrument.

CAT and QEP Assessment

TTU is planning to use the CAT instrument to assess progress on the QEP over the next five years. Although this instrument was designed before the University selected its QEP topic, it is probably the single best measure of student skills in four of the five skill areas associated with the QEP topic (critical thinking, real-world problem solving, communication, and creative thinking). We will use the CAT instrument to track improvements in students' skills over the course of the QEP. We plan to administer the instrument to a stratified random sample of approximately 150 - 200 seniors each year to track progress. Improvements on this test will be gradual. Significant progress is not expected until the later stages of the QEP. Although TTU has invested considerable time and resources in the development of an instrument to assess critical thinking over the past five years, we have not yet implemented a plan to try to improve the skills that this test measures. In retrospect, we would like to claim that it was our intention all along to develop an effective assessment tool for critical thinking and then to use that assessment tool to guide improvement efforts. In reality, we are simply very fortunate that our campus interest in a QEP topic aligned with those previous efforts to develop an effective assessment tool. Consequently, our QEP will allow us to derive additional benefit from the expense and effort that was devoted to the development of the CAT instrument.

CCTST

As noted above, TTU has been exploring methods for evaluating students' critical thinking skills since 2000 as part of a state-wide performance funding initiative. These efforts have led us to explore a variety of existing assessment tools. One objective test of critical thinking that we have used is the California Critical Thinking Skills Test (CCTST). While this test does not assess all of the important skills that our faculty associate with critical thinking, it does provide an index of some skills traditionally associated with critical thinking (e.g., reasoning, drawing conclusions, evaluating arguments). TTU will use this test as another means of evaluating progress on the QEP and as a tool for evaluating our general education program beginning in the 2005-2006 academic year. This instrument is administered to a stratified random sample of 400 - 500 seniors each year. The results are reported to THEC. We will be looking for improvements in the institution average on the CCTST during the later stages of the QEP implementation.

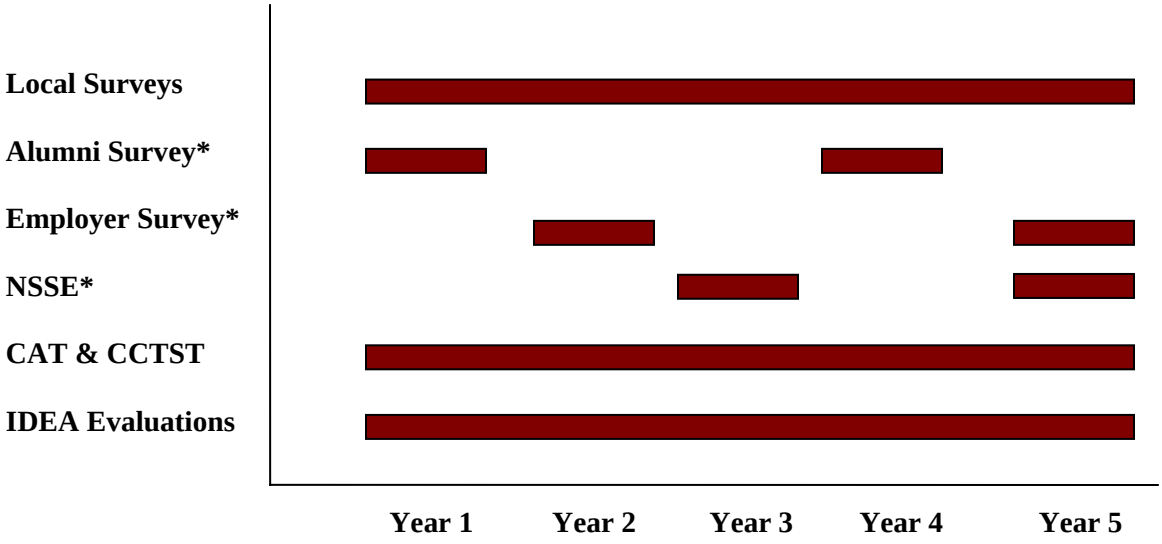
Individual Project and Unit Plan Assessments

Individual instructors and units have and will continue to develop assessment plans for proposals that they submit to address the QEP to measure progress on these projects. These assessments may include any of the assessment measures discussed above. In some cases, additional surveys or assessments are proposed that are oriented toward the specific project being implemented. The assessment plan for each project will provide additional benchmarks of QEP progress as well as formative feedback for these individual projects. Individual project assessments are described in specific proposals (See examples in Appendix K & L.).

One of the overall measures of progress on the QEP will relate to the proportion of funded projects that achieve success on their selected measures of progress (See measurable objectives table.). The success rate of funded projects is expected to increase as the campus becomes more familiar with effective strategies. The QEP committee will use these measures of success to help determine future funding priorities and recommendations for future proposal topics.

Assessment Schedule

Many of the planned assessment activities are ongoing and hence will occur throughout the implementation of the QEP. Other assessment activities are performed on a schedule determined by our governing board and/or Performance Funding Guidelines that we must follow. The time-line below shows when we expect to perform each type of assessment.

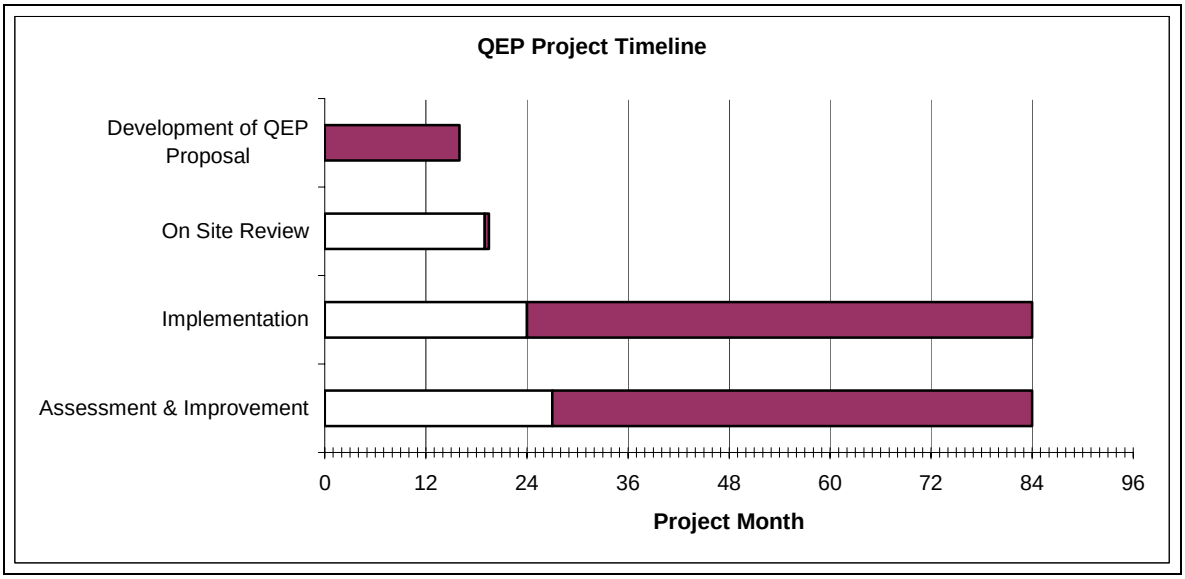


*Scheduled by Governing Board

Implementation Plan & Schedule

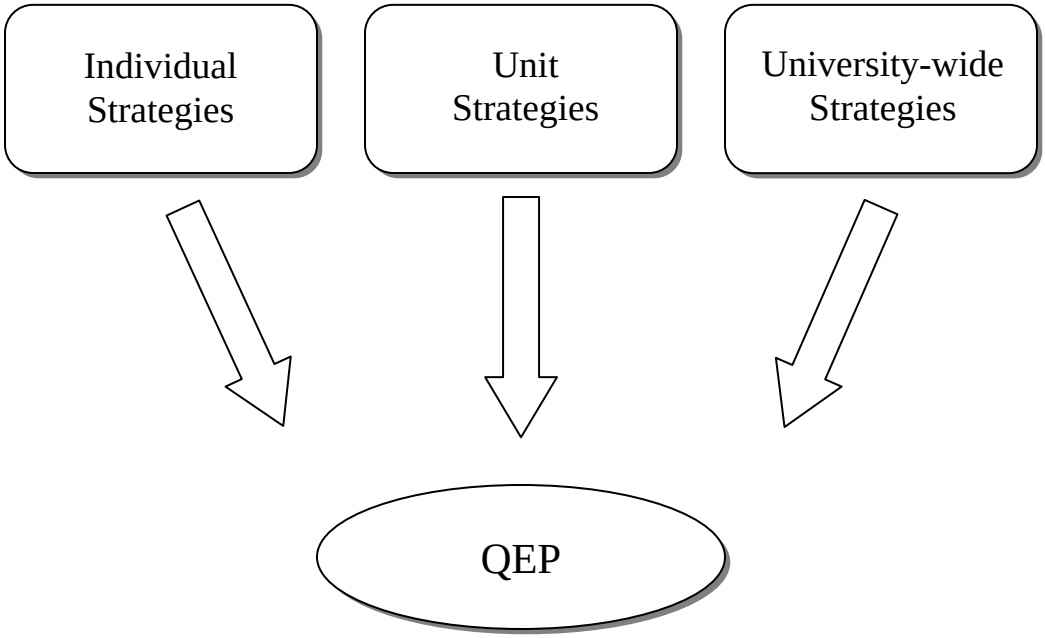
Overall Project

Planning work on the TTU QEP began in the fall of the 2004 - 2005 academic year. This work does not include the preparatory work that was done to formulate a vision and an accompanying mission and strategic plan, or the development work on the CAT instrument. Implementation of the QEP will begin when SACS approval is given.



Components of the Implementation Plan

TTU's QEP involves several levels of implementation to maximize campus involvement. Implementation plans range from individual faculty/staff projects to unit level projects to interdisciplinary University-wide projects. Once the QEP plan is approved by SACS, we plan to immediately implement projects at each of these levels. Some projects require additional funds for implementation while others do not. The University is committing approximately $35,000 per year to fund innovative projects and to provide incentives associated with the implementation of the QEP. These funds will be distributed across units and individual faculty/staff to fund the most promising proposals each year. While this expenditure is not extraordinary for large universities, this funding represents a serious commitment at TTU. TTU will use a competitive process of awarding funds, and decisions about funding will be made by the QEP committee after SACS approval of the QEP. It is hoped that this process will focus considerable interest and attention on the QEP topic and help create a campus culture that values improving students' critical thinking/real-world problem solving skills.



We expect that the value of providing funding for these QEP projects will be out of proportion to the actual dollar amount a university of our size can afford to commit to this project. That is, the funding will stimulate more activities related to the QEP than are actually funded. For example, we expect interest in implementing many of the good ideas that are developed but that can not be funded to persist and in some cases be implemented using other resources within departments or colleges. The QEP will also be one of seven university-wide strategic goals that units across campus develop strategic plans to address each year.

Teaching Learning/Enhancement Grants (Individual Strategies)

The University has solicited proposals from individual faculty/staff members for innovative ideas to improve student learning on the QEP topic. These proposals have a limit of $3000. The funds can be used for a variety of purposes (e.g., travel, teaching assistants, supplies/equipment, etc.). As soon as the QEP is approved, the proposals will be reviewed and prioritized. Funds will be made available to the recipients of the selected proposals during the first year of implementation. Additional requests for new proposals will be solicited before each new academic year.

TTU has received a variety of proposals from individual faculty and staff across campus. A sample of these proposals appears in Appendix L. These proposals involve the application and implementation of innovative methods for using active learning strategies to address the QEP topic. In many cases, there has been insufficient encouragement, incentive, or funding to implement these ideas. The funding and institutional emphasis on the QEP topic will empower our faculty and staff to implement many of these ideas.

Unit Plans for the QEP

The University has also solicited proposals from departments/planning units for innovative ideas to improve student learning on the QEP topic. Examples of proposals that have been submitted appear in

Appendix K. Some of these proposals request funds to send faculty members to workshops for advanced pedagogical training in their discipline – training that would prepare faculty to use active learning strategies to improve students' critical thinking and problem solving skills. Other proposals involve the application and implementation of innovative methods for using active learning strategies to improve students' critical thinking and real-world problem skills. These proposals also have a limit of $3000. As soon as the QEP is approved, the proposals will be reviewed and prioritized. Funds will be made available to the recipients of the selected proposals during the first year of implementation. Additional requests for new proposals will be solicited before each new academic year.

University-wide Strategies

There are currently two University-wide strategies or initiatives that are planned for the QEP. These strategies include a faculty mentoring program to share expertise in active learning strategies that are appropriate for our QEP topic across the campus and an experimental project related to a new way of using the CAT instrument. These strategies are described in more detail below.

Faculty Mentoring Program

Although the mentoring program is listed as University-wide strategy, it involves linking together faculty who have been using active learning strategies for improving students' critical thinking and real-world problem solving skills with other faculty who are interested in learning to apply these pedagogical strategies. The mentoring program will begin with University-wide efforts to identify exemplary strategies that are currently being used by faculty at TTU. The goal is to replicate and extend these "best practices" through incentives.

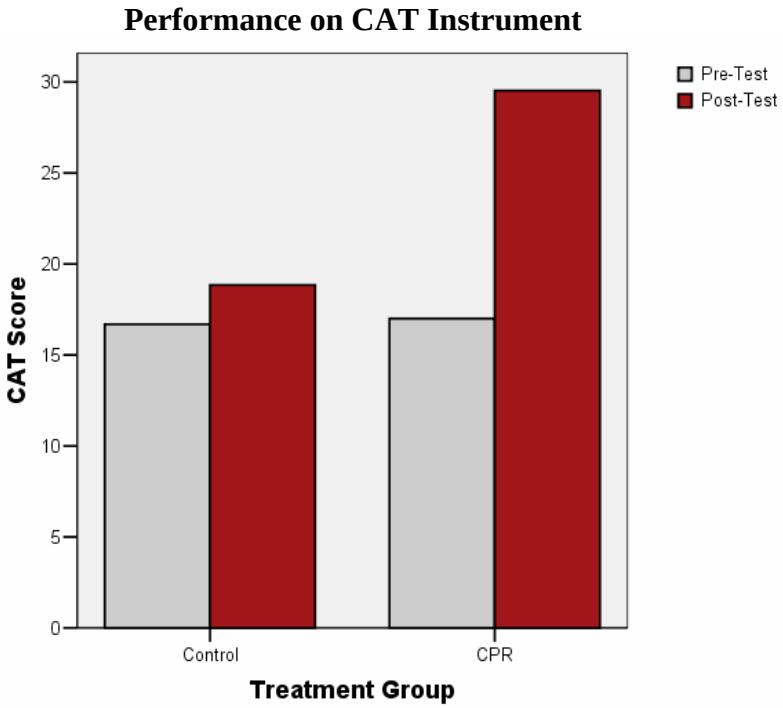
Each year the University will solicit examples of "best practices" relevant to our QEP topic. A competitive review will be used to identify the best ideas that can be replicated in other areas. Faculty who submit the best ideas will receive a $1000 award to participate in a workshop with other faculty who are interested in learning about using active learning strategies to improve students' critical thinking and real-world problem solving skills. The best ideas for improving student learning on the QEP topic will also be posted on our QEP website. Faculty who wish to develop new Teaching/learning Enhancement Proposals will be encouraged to explore and extend these ideas to other disciplines and courses. The request for examples of "best practices" currently in use at the University will occur in April.

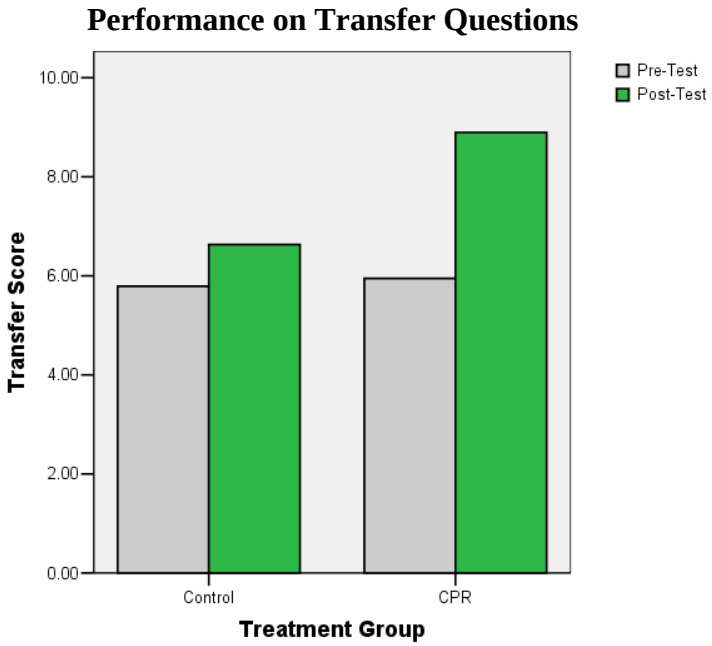
Modified Calibrated Peer Review Adapted to the CAT

Although the CAT instrument was designed primarily as an assessment tool, we have conducted a recent pilot study in response to a suggestion from one of our NSF consultants on Project CAT to explore how students might actually use the test as a learning experience to improve their critical thinking skills. This pilot study used a modified version of the Calibrated Peer Review™ (CPR) process developed at UCLA and funded by the NSF. The UCLA Calibrated Peer Review™ process incorporates a method for training students to grade essays using expert evaluations as a calibration tool. In our pilot study, a small group of students was trained to score the CAT instrument using a procedure that was adapted from CPR. Specifically, students were trained to score the CAT test using a detailed scoring guide in combination with tests that had already been scored by trained faculty graders. During training students calibrated their evaluations of tests with those of the faculty graders. The training afforded numerous opportunities to explore the rationale for assigning scores to each response on the test. After two three-hour training sessions, students were given the opportunity

to score numerous CAT tests without any further training. The results of that pilot study suggest that students can be taught to score the CAT test using procedures akin to those developed in "calibrated peer review" programs.

We also compared students in the modified calibrated peer review pilot study to a control group. Both groups took a pre-test and post-test that included questions from the CAT instrument together with several analogous transfer questions. Students who participated in the modified calibrated peer review training not only improved significantly more that the control group on the CAT questions they were trained on, they also improved significantly more than the control group on analogous transfer questions that they were not trained to score.



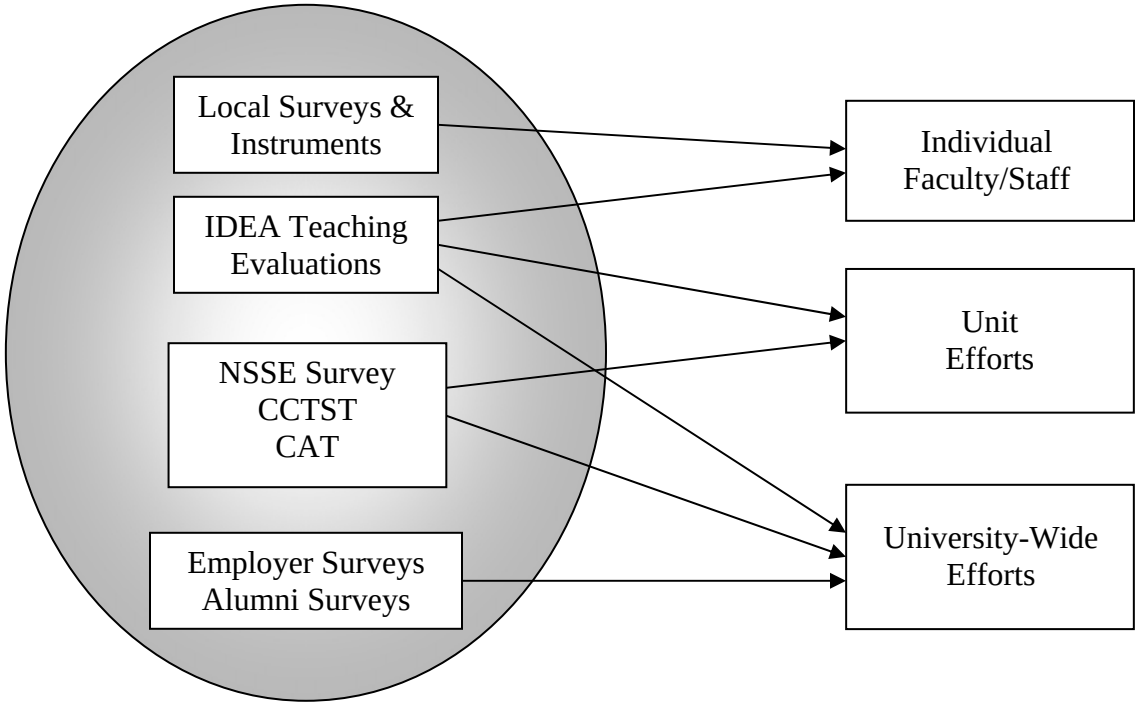


Although the results described above are quite promising, they have not been replicated and require further evaluation. We will explore the use of a modified calibrated peer review process adapted to the CAT instrument as a means to improve students' critical thinking and real-world problem solving skills on a small scale to help evaluate the value of this strategy. If this strategy is successful, we will examine effective methods for expanding its use.

Formative and Summative Assessment Opportunities

Although we have previously described the variety of assessment tools we will use to evaluate progress on our QEP, it is important to note that these assessments will be useful in providing both formative and summative assessments throughout the project. Although changes in student performance on critical thinking tests may require extended efforts over a period time, other assessments such as student evaluation of teaching, the frequency with which instructors select critical thinking as an important course goal, and student responses to relevant questions on the NSSE should be more sensitive to changes in University emphasis earlier in the QEP process. These assessments will be used to help make adjustments to the implementation plan when necessary so that we can maximize our progress. The figure below illustrates how these different assessment activities are expected to provide feedback for different entities at the University. Some assessments like the IDEA teaching evaluations provide feedback at the individual, unit, and University level. Other assessments like the employer survey and alumni survey provide only aggregate data across the University.

Using Assessment Data for Formative and Summative Evaluation



Although the CAT instrument will provide information for both formative and summative assessment at the unit and university level, it will also provide a means to stimulate faculty recognition of our students' shortcomings and help motivate them to pursue methods to improve student performance. The CAT instrument is somewhat unique in this respect since it requires an institution's own faculty to score the short answer essay questions. Faculty will see first hand the shortcomings of our students and the need for improvement. We will try to involve as many different faculty as possible in the test scoring process each year to maximize such opportunities for formative assessment.

QEP Leadership

The successful implementation of the QEP will require support from five administrative groups, the Executive Advisory Council, the Office of Academic Affairs, the Office of University Planning, the QEP Committee, and the QEP Director.

Executive Advisory Council

The Executive Advisory Council consists of the president, provost, all vice-presidents (financial affairs, university advancement, student affairs), associate vice-presidents (academic affairs), the director of athletics, and the president of the faculty senate. This council meets regularly and will have responsibility for communicating the importance of the QEP to the campus and ensuring that appropriate resources are allocated to the project.

Office of Academic Affairs

The office of academic affairs includes the provost and two associate vice-presidents. This office will directly oversee the implementation of the QEP and the associated budget and expenditures. A member of this office also serves as the SACS liason and oversees compliance issues and will oversee reporting on the QEP.

Office of University Planning

The office of planning will have responsibility for coordinating the integration of the QEP with the University's strategic plan. This office will also provide the support needed to help collect and analyze assessment data to evaluate progress on the QEP and suggest strategies to improve the effectiveness of the QEP.

QEP Committee

The QEP committee will serve as a conduit to engage the campus in ongoing activities and will provide a resource person for each academic division. This committee will also make recommendations for allocating limited resources for projects associated with the QEP.

QEP Director

The president in consultation with the provost, associate vice-president for academic affairs, and the director of planning, will appoint a QEP director to help implement the QEP plan. The director will be a member of the faculty with experience and knowledge related to the QEP topic. This individual will receive one course release-time or equivalent pay for these added responsibilities. A small budget will also be provided for supplies. Secretarial support will be provided out of the Office of Academic Affairs when needed.

Proposed Budget

The president has approved a budget of approximately $50,000 per year for the Quality Enhancement Plan over a five year period. The sources of the funds for the QEP include the TTU Foundation and the President's Office.

Proposed Budget for QEP

	Year 1	Year 2	Year 3	Year 4	Year 5
Administration					
QEP Director - Release Time 3hr/Semester	$7,500	$7,500	$7,500	$7,500	$7,500
Supplies	$500	$500	$500	$500	$500
Testing (beyond normal expenditures)					
CAT Testing	$5,000	$5,000	$5,000	$5,000	$5,000
Unit & Individual Incentives to Implement Plans					
QEP Implementation Incentives	$35,000	$35,000	$35,000	$35,000	$35,000
Yearly Total	$48,000	$48,000	$48,000	$48,000	$48,000
Grand Total =	$240,000				

Strategic Importance of the QEP

The QEP is one of seven strategic goals within the 2005-2010 TTU strategic plan. It is also a goal that aligns closely with the vision and various other strategic goals in our strategic plan.

TTU Strategic Goals 2005-2010

1.1 Promote and effectively communicate the positive impact of TTU on students, alumni, faculty, and community.
2.1 Enhance the rate and diversity of participation in higher education by Tennesseans.
3.1 Increase alumni involvement in activities that promote life-long learning, program improvement, and the mentoring of current students.
3.2 Enhance student involvement to promote healthy social relationships, academic success, and a sense of community within the University.
3.3 Develop and implement a QEP that is focused on improving critical thinking/real-world problem solving skills through the use of active learning strategies.
3.4 Enhance the campus infrastructure to effectively support all programs and objectives.
4.1 Stimulate activities that increase external funding and efficiency/cost saving through individual and unit incentives.

Many of the active learning strategies that will be used to address the QEP topic will have implications for other strategic goals. For example, the increased use of active learning strategies that focus on critical thinking/real-world problem solving should

- Have a positive impact on students' life-long success as well as the communities and employers where they choose to pursue their careers.
- Benefit the surrounding communities in which real-world projects are pursued.
- Increase high school students' desire to attend college by making courses and the college experience more interesting.
- Increase student engagement and motivation which should positively affect retention and graduation rates.
- Encourage alumni involvement.
- Improve student and alumni perceptions of the University and have a positive impact on alumni giving.
- Provide numerous examples to communicate the positive impact of the University on students, alumni, faculty, and the community.

The strategic importance of the QEP is also recognized within the state planning processes. The new 2005-2010 THEC Performance Funding Requirements stipulate that each institution's SACS QEP will become one of the Institution's Performance Funding Goals. Consequently, progress on the QEP will directly impact funding received from the state.

Dissemination & Marketing

The efforts to engage the campus community in the development of the QEP, which were described earlier, made extensive use of focus groups, campus meetings, web interfaces, and email involving students, faculty, staff, and administrators. As the QEP is implemented a broad communication plan will go into effect. Since the QEP is an integral part of TTU's strategic plan and vision, it will play a prominent role in the public relations marketing plan of the University. Efforts to disseminate information about the plan will focus on several different audiences and objectives.

Campus Community

The success of the QEP depends on continued campus involvement and interest. The incentives for unit and individual faculty/staff projects will play an important role in this involvement, but effective communication of information about these opportunities to faculty, staff, and students will also be important. These efforts will be accomplished through various means including

- Campus meetings
- Direct email
- QEP website
- TTU homepage
- Press releases
- Faculty/staff newsletter

Our communication activities for the campus community will also highlight successful strategies to encourage replication of effective techniques in other areas of the campus. Information about successful approaches will be disseminated through workshops in addition to those strategies mentioned above.

Alumni

The QEP's emphasis on real-world problem solving lends itself to projects that involve alumni participation and mentoring of students. We see many potential benefits for both our alumni and students in these partnerships. Indeed, this type of alumni involvement is also emphasized in other areas of our new strategic plan. Our communication efforts with our alumni will seek to encourage their involvement in innovative projects related to the QEP, as well as to encourage their financial support of the QEP. These efforts will be accomplished through various means including

- Alumni publications
- Campus meetings with alumni
- Direct communication between faculty and alumni
- Press releases
- Email/newsletter
- QEP website
- TTU homepage

Surrounding Region & Nation

The QEP will involve numerous projects in which students work on real-world problems in the surrounding communities. Many of these efforts will be of interest to the public and other institutions across the country. Efforts to publicize these activities will involve

- Press releases
- QEP website
- TTU homepage
- Presentations at regional and national meetings

Elements of Proposed Dissemination & Marketing Plan

Audience	Campus Meetings	Direct Email	QEP Website	TTU Homepage	Press Releases	Presentations & Publications
Campus Community	✓	✓	✓	✓	✓	✓
Alumni	✓	✓	✓	✓	✓	✓
Surrounding Region & Nation			✓	✓	✓	✓

Measurable Objectives

Area	Year 1	Year 2	Year 3	Year 4	Year 5
Implementation	Director Appointed $35,000 in grants awarded	$35,000 in grants awarded	$35,000 in grants awarded	$35,000 in grants awarded	$35,000 in grants awarded
Frequency Relevant Objectives Selected on IDEA		5% Increase over Baseline *	10% Increase over Baseline	15% Increase over Baseline	20% Increase over Baseline
Student Progress on Relevant IDEA Objectives		5% Increase over Baseline *	10% Increase over Baseline	15% Increase over Baseline	20% Increase over Baseline
NSSE Responses on Relevant Items			5% increase over Baseline** or above National Average		10% increase over Baseline** and above National Average
CCTST Results			5% increase over Baseline** or above National Average	10% increase over Baseline** or above National Average	15% increase over Baseline** or above National Average
CAT Results			5% increase over Baseline***	10% increase over Baseline	15% increase over Baseline
Alumni Survey Responses on Relevant Items				5% increase over Baseline***	
Employer Survey Responses on Relevant Items					5% increase over Baseline****
Individual Project Assessments	50% Successful	55% Successful	60 % Successful	65% Successful	70% Successful

*Baseline established over previous 3 year period.

**Baseline established in 2006

***Baseline established in 2005

****Baseline established during 2008 (2006 graduates)

Summary

TTU has sought to develop a Quality Enhancement Plan that addresses identified weaknesses and is closely allied to our new vision and strategic plan. The development process made effective use of available assessment data, focus groups, and information technology to maximize opportunities for campus input and involvement. The topic chosen "***Improving critical thinking/real world problem solving skills through the use of active learning strategies***" was designed to maximize campus involvement and commitment. Our future efforts to address this topic will improve student learning and facilitate our students' life-long success.

The implementation of this plan involves creating a campus culture that values innovative strategies for improving students' critical thinking/real-world problem solving skills using active learning strategies. Our effectiveness in creating this campus culture will depend on two things: (1) the commitment from our administration to emphasize the importance of these activities and (2) providing incentives for faculty and units to pursue these activities. Our incentives will not only encourage the use of innovative ideas for student learning, but they will also encourage the sharing of best practices for accomplishing goals related to the QEP through a mentoring program.

Our assessment plan seeks to use converging evidence from a variety of instruments that are nationally benchmarked or are in the process of being nationally benchmarked (e.g., IDEA System, NSSE, CCTST, and the CAT). We will supplement these assessments with other measures of alumni satisfaction (a THEC survey that is widely used in Tennessee) and our employer survey that we conduct on a regular basis as part of a state-wide Performance Funding Program. In addition, individual units and faculty may supplement these assessment tools with more specific assessments that are designed to evaluate progress on their specific projects. The latter measures are described in more detail in individual and unit plans that appear in Appendices I & J. Together, these assessments will help us evaluate progress, identify effective strategies, make adjustments in strategies that are not effective, and replicate and extend practices that contribute to progress on our QEP goals.

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Appendices

Supporting Materials

Appendix A

SACS Leadership Team

Robert Bell, President

Marvin Barker, Provost and Vice President for Academic Affairs

Leo McGee, Associate Vice President for Academic Affairs, SACS Liaison

Linda Maxwell, Associate Vice President for Fiscal Affairs

Glenn James, Director of Institutional Research

Barry Stein, Director of Planning

Craft Hayes, SGA President

Appendix B

SACS QEP Committee

- **Dr. Barry Stein, Chairperson**
  Director of Planning, Psychology - Professor
- Dr. Joseph Biernacki, Engineering - Professor
- Misty Cecil, Student
- Dr. Glenn Cunningham, Engineering - Associate Professor
- Theresa Ennis, Student
- Dr. Wade Faw, Agriculture - Director
- Dr. Ada Haynes, Arts & Sciences - Professor
- Dr. Sandi Smith, Education - Assistant Professor
- Gail Stearman, Nursing - Assistant Professor
- Dr. Thomas Timmerman, Business Administration - Associate Professor

Appendix C

SACS Compliance Committee

Glenn James, Chairperson, Institutional Research - Director

Misty Cecil, Education - Graduate Student

AD HOC COMMITTEES

Subramaniam Deivanayagam, Chairperson, Engineering - Associate Dean
Ward Doubet, Education - Professor
Marketta Laurila, Arts & Sciences - Chairperson
Scott Northrup, Arts & Sciences - Chairperson
Cynthia Webster, Student Affairs - Director

Gary Pickett, Chairperson, Business Administration - Associate Dean
Sue Bailey, Agriculture & Human Ecology - Director
Robert Clougherty, Arts & Sciences - Professor
Dennis George, Center of Excellence - Director

Paul Semmes, Chairperson, Arts & Sciences - Associate Dean
Phillip Campana, Arts & Sciences - Professor
Bobby Hodum, Undergraduate Admissions - Assistant Director
Deanna Nipp, Library - Coordinator

John Wheeler, Chairperson, Education - Associate Dean
Kurt Eisen, Arts & Sciences - Chairperson
Sheila Green, Nursing - Director
Jeff Young, Business & Fiscal Affairs - Director

Appendix D

SACS Steering Committee

Linda Null, Chairperson, Arts & Sciences – Associate Professor and President of Faculty Senate, 2004-2005

Jack Armistead, Arts & Sciences - Dean
Curtis Armstrong, Business Administration - Associate Professor
Ed Boucher, Student Affairs - Dean
Don Elkins, Agriculture & Human Ecology - Dean
Susan Elkins, Interdisciplinary Studies & Extended Education - Dean
Darrell Garber, Education - Dean
Monica Greppin, Public Affairs - Director
Tom Hamilton, Advancement - Vice President
Darrell Hoy, Engineering - Chairperson
Glen Johnson, Engineering - Dean
Wali Kharif, Arts & Sciences - Professor
David Larimore, Education - Professor and President of Faculty Senate, 2005-2006
Regina Lee, Library - Assistant Professor
Robert Niebuhr, Business Administration - Dean
Francis Otuonye, Research & Graduate Studies - Associate Vice President
Larry Peach, Education - Chairperson
Danny Reese, Information Technology Services - Associate Vice President
Jeff Roberts, Arts & Sciences - Chairperson
Gretta Stanger, Arts & Sciences - Chairperson
Rebecca Tolbert, Academic Affairs & Enrollment Management - Associate Vice President
Winston Walden, Library - Director
Mark Wilson, Athletics - Director

Appendix E

Tennessee Technological University

Strategic Plan

2005 – 2010

Approved by the Tennessee Board of Regents on December 2, 2005

Tennessee Technological University

Vision

TTU will be one of the best universities in the nation through a commitment to the life-long success of our students.

Tennessee Technological University

Mission

Tennessee Technological University's mission as the state's only technological university is to provide leadership and outstanding programs in engineering, the sciences, and related areas that benefit the people of Tennessee and the nation. The University also provides strong programs in the arts and sciences, business, education, agriculture and human ecology, nursing, music, art, and interdisciplinary studies. Tennessee Tech serves students from throughout the state, nation, and many other countries; but it retains a special commitment to enrich the lives of people and communities in the Upper Cumberland region of Tennessee.

The University is committed to the life-long success of students in its undergraduate, master's, specialist, and doctoral degree granting programs through high-quality instruction and learning experiences. The University is engaged in scholarly activity, especially basic and applied research, creative endeavors, and public service, with special emphasis on community and economic development. The University supports student participation in a broad array of extracurricular activities as an integral component of its commitment to student life and success.

The University's three interdisciplinary Accomplished Centers of Excellence in Energy Systems Research, Manufacturing, and Water Resources and Chairs of Excellence in Business Administration strengthen the instructional, research, and service mission of the University.

The University is as supportive of women as of men and as supportive of those in the minority as of those in the majority. The University provides educational opportunities to all eligible persons without regard to age, gender, ethnicity, race, religion, national origin, disability, or sexual orientation. The institution is committed to an inclusive and diverse campus that enriches the educational experience, promotes personal growth and a healthy society, prepares students for success in a global economy, and enhances America's economic competitiveness.

Tennessee Technological University is a member of the State University and Community College System of Tennessee and is governed by the Tennessee Board of Regents.

Tennessee Technological University

Strategic Goals 2005 - 2010

Leadership:

1.1 Promote and effectively communicate the positive impact of TTU on students, alumni, faculty, and community.

Access:

2.1 Enhance the rate and diversity of participation in higher education by Tennesseans.

Quality:

3.1 Increase alumni involvement in activities that promote life-long learning, program improvement, and the mentoring of current students.

3.2 Enhance student involvement to promote healthy social relationships, academic success, and a sense of community within the university.

3.3 Develop and implement a QEP that is focused on improving critical thinking/real-world problem solving skills through the use of active learning strategies.

3.4 Enhance the campus infrastructure to effectively support all programs and objectives.

Resourcefulness:

4.1 Stimulate activities that increase external funding and efficiency/cost saving through individual and unit incentives.

Tennessee Technological University
2005 – 2010 Strategic Plan
Measurable Objectives

Leadership:

1.1 Promote and effectively communicate the positive impact of TTU on students, alumni, faculty, and community.

Measurable Objective 1.1a

Increase the number of press releases, presentations, focus groups, or articles published for Tennessee audiences that could positively affect their attitudes about TTU related to • **P -16 initiatives** • **Community-related projects** • **Workforce development** • **Effective use of technology** • **Research, service, and outreach** **The institution will increase these communication activities by 25% over the baseline by the end of cycle.**	
2004-05 Base Year Objective Baseline	219
2005-06 projected progress	5% increase over baseline.
2006-07 projected progress	10% increase over baseline or increase over prior year.
2007-08 projected progress	15% increase over baseline or increase over prior year.
2008-09 projected progress	20% increase over baseline.
2009-10 projected progress	25% increase over baseline.

Measurable Objective 1.1b

Increase the number of campus activities related to • **P -16 initiatives** • **Community-related projects** • **Workforce development** • **Effective use of technology** • **Research, service, and outreach** **The institution will increase these activities by 25% over the baseline by the end of cycle.**	
2004-05 Base Year Objective Baseline	110 activities
2005-06 projected progress	5% increase over baseline.
2006-07 projected progress	10% increase over baseline or increase over prior year.
2007-08 projected progress	15% increase over baseline or increase over prior year.
2008-09 projected progress	20% increase over baseline.
2009-10 projected progress	25% increase over baseline.

Access:

2.1 Enhance the rate and diversity of participation in higher education by Tennesseans.

Measurable Objective 2.1a

Increase minority enrollment (with preference for African Americans to increase diversity). Minority enrollment includes African American, Hispanic/Latino, Native American and Asian American. The institution will increase minority enrollment by 9% over baseline by end of cycle.	
2004-05 Base Year Objective Baseline	759 minority students
2005-06 projected progress	1% above baseline.
2006-07 projected progress	3% above baseline or above previous year .
2007-08 projected progress	5% above baseline or above previous year.
2008-09 projected progress	7% above baseline.
2009-10 projected progress	9% above baseline.

Measurable Objective 2.1b

Increase enrollment from under-represented counties. The institution will increase enrollment from 3 under-represented counties each year until end of cycle.	
2004-05 Base Year Objective Baseline	Increased enrollment from 3 under-represented counties.
2005-06 projected progress	Increase enrollment from 3 under-represented counties.
2006-07 projected progress	Increase enrollment from 3 under-represented counties.
2007-08 projected progress	Increase enrollment from 3 under-represented counties.
2008-09 projected progress	Increase enrollment from 3 under-represented counties.
2009-10 projected progress	Increase enrollment from 3 under-represented counties.

Measurable Objective 2.1c

Increase off-campus enrollment (FTE including RODP) for fall or spring semester by 15% by end of cycle.	
2004-05 Base Year Objective Baseline	706
2005-06 projected progress	4% increase in either fall or spring enrollment over baseline.
2006-07 projected progress	7% increase in either fall or spring enrollment over baseline.
2007-08 projected progress	10% increase in either fall or spring enrollment over baseline.
2008-09 projected progress	13% increase in either fall or spring enrollment over baseline.
2009-10 projected progress	15% increase in either fall or spring enrollment over baseline.

Quality:

3.1 Increase alumni involvement in activities that promote life-long learning, program improvement, and the mentoring of current students.

Measurable Objective 3.1a

Increase alumni involvement in activities related to the mentoring of current students (as reflected by survey results or actual count) by 30% over baseline by end of cycle. We will be conducting both a survey as well as an actual count of alumni involved in mentoring activities. Survey Questions: Since graduation, I have participated in activities to help TTU students or new graduates be more successful. Since graduation, TTU has provided opportunities for me to work with current students and new graduates to help them be more successful.	
2004-05 Base Year Objective Baseline	Count = 123 alumni Survey score = 2.52 (out of 5)
2005-06 projected progress	Increase of 10% over baseline on involvement or survey results.
2006-07 projected progress	Increase of 15% over baseline or 5% over prior year on involvement or survey results.
2007-08 projected progress	Increase of 20% over baseline or 5% over prior year on involvement or survey results.
2008-09 projected progress	Increase of 25% over baseline or 5% over prior year on involvement or survey results.
2009-10 projected progress	Increase of 30% over baseline on number of alumni involved or survey results.

Measurable Objective 3.1b

Increase alumni involvement in activities related to program improvements (as reflected by survey results or actual count) by 25% over baseline by end of cycle. We will be conducting both a survey as well as an actual count of alumni involved in program improvement activities. Survey Question: Since graduation, TTU has provided opportunities for me to make suggestions about how to improve programs and services.	
2004-05 Base Year Objective Baseline	Count = 157 alumni Survey score = 3.57 (out of 5)
2005-06 projected progress	Increase of 5% over baseline on involvement or survey results.
2006-07 projected progress	Increase of 10% over baseline or 5% over prior year on involvement or survey results.
2007-08 projected progress	Increase of 15% over baseline or 5% over prior year on involvement or survey results.
2008-09 projected progress	Increase of 20% over baseline or 5% over prior year on involvement or survey results.
2009-10 projected progress	Increase of 25% over baseline on number of alumni involved or survey results.

Measurable Objective 3.1c

Increase the number of Continuing Education and Professional Development Opportunities for Alumni (as reflected by survey results or actual count) by 25% over baseline by end of cycle. We will be conducting an actual count as well as a survey. Survey Questions: Since graduation, TTU has provided opportunities for me to participate in professional development courses/seminars that would help me be more successful. Since graduation, I have participated in professional development courses/seminars at TTU that have helped me be more successful.	
2004-05 Base Year Objective Baseline	Count = 50 educational opportunities Survey score = 2.98 (out of 5)
2005-06 projected progress	Increase of 5% over baseline on opportunities or survey results.
2006-07 projected progress	Increase of 10% over baseline or 5% over prior year on opportunities or survey results.
2007-08 projected progress	Increase of 15% over baseline or 5% over prior year on opportunities or survey results.
2008-09 projected progress	Increase of 20% over baseline or 5% over prior year on opportunities or survey results.
2009-10 projected progress	Increase of 25% over baseline on number of opportunities or survey results.

3.2 Enhance student involvement to promote healthy social relationships, academic success, and a sense of community within the university.

Measurable Objective 3.2a

Increase scores on the National Survey of Student Engagement (NSSE) to be equivalent* to or above the national average for our peers by end of cycle for either freshmen or seniors on NSSE items directly related to this goal. The NSSE is administered in year 1 and year 4 of the strategic plan. * Equivalence is defined as not significantly different from the peer group mean, $p > .05$. ** Relevant NSSE items and baseline means can be found at http://www.tntech.edu/planning/Assessment/NSSE.htm	
2004-05 Base Year Objective Baseline	Relevant NSSE items and baseline means can be found at http://www.tntech.edu/planning/Assessment/NSSE.htm
2005-06 projected progress	Increase over baseline scores or equal/above national average for either freshmen or seniors.
2006-07 projected progress	Not administered.
2007-08 projected progress	Not administered.
2008-09 projected progress	Equal or above national average for either freshmen or seniors.
2009-10 projected progress	Not administered.

Measurable Objective 3.2b

Increase retention rates (fall to fall) for first-time freshmen to be above the national average for our peers by end of cycle.	
2004-05 Base Year Objective Baseline	70.96
2005-06 projected progress	71.5% or above baseline.
2006-07 projected progress	72% or above prior year.
2007-08 projected progress	73% or above prior year.
2008-09 projected progress	74% or above national average.
2009-10 projected progress	Above national average.

Measurable Objective 3.2c

Increase the graduation rate (six year) to be above the national average for our peers by end of cycle.	
2004-05 Base Year Objective Baseline	44.1%
2005-06 projected progress	44.5% or above baseline.
2006-07 projected progress	45% or above prior year.
2007-08 projected progress	45.5% or above prior year.
2008-09 projected progress	48% or above prior year.
2009-10 projected progress	Above national average.

3.3 Develop and implement a QEP that is focused on improving critical thinking/real-world problem solving skills through the use of active learning strategies.

Measurable Objective 3.3

To implement a successful QEP.	
2004-05 Base Year Objective Baseline	Select QEP topic
2005-06 projected progress	Obtain campus input for QEP and obtain SACS approval of QEP topic.
2006-07 projected progress	Begin implementation of QEP.
2007-08 projected progress	QEP year 1 goals achieved.
2008-09 projected progress	QEP year 2 goals achieved.
2009-10 projected progress	QEP year 3 goals achieved.

3.4 Enhance the campus infrastructure to effectively support all programs and objectives.

Measurable Objective 3.4

Continue to pursue projects (over $100,000) that involve formal planning, implementation, or completion of improvements to the campus infrastructure.	
2004-05 Base Year Objective Baseline	6 projects
2005-06 projected progress	6 projects
2006-07 projected progress	6 projects
2007-08 projected progress	6 projects
2008-09 projected progress	6 projects
2009-10 projected progress	6 projects

Resourcefulness:

4.1 Stimulate activities that increase external funding and efficiency/cost saving through individual and unit incentives.

Measurable Objective 4.1a

Increase fundraising as reflected by a composite measure (dollars in gifts received – [gifts-in-kind donations] + total of gift pledges recorded) by 25% over baseline by end of cycle.	
2004-05 Base Year Objective Baseline	$3,600,000
2005-06 projected progress	Increase of 5% over baseline.
2006-07 projected progress	Increase of 10% over baseline or 5% over previous year.
2007-08 projected progress	Increase of 15% over baseline or 5% over previous year.
2008-09 projected progress	Increase of 20% over baseline or 5% over previous year.
2009-10 projected progress	Increase of 25% over baseline.

Measurable Objective 4.1b

Increase externally supported research & service 60% over baseline by end of cycle.	
2004-05 Base Year Objective Baseline	$12,280,072
2005-06 projected progress	Increase of 5% over baseline.
2006-07 projected progress	Increase of 15% over baseline or 10% over prior year.
2007-08 projected progress	Increase of 30% over baseline or 10% over prior year.
2008-09 projected progress	Increase of 45% over baseline or 10% over prior year.
2009-10 projected progress	Increase of 60% over baseline.

Measurable Objective 4.1c (also relates to Quality Goals)

Increase incentives awarded to support entrepreneurial activities and quality initiatives. Entrepreneurial activities include programs designed to increase external funding (e.g., research grants, marketable patents, income generating programs) and activities that provide innovative solutions for reducing costs and improving efficiency. Activities that support quality initiatives relate to one of the 4 quality goals (e.g., activities designed to increase the success of the QEP, improve student involvement/academic success, improve alumni involvement, etc). The institution will increase the number of incentives provided annually by 25% over baseline by end of cycle.	
2004-05 Base Year Objective Baseline	41
2005-06 projected progress	5% increase over baseline.
2006-07 projected progress	10% increase over baseline.
2007-08 projected progress	15% increase over baseline.
2008-09 projected progress	20% increase over baseline.
2009-10 projected progress	25% increase over baseline.

Measurable Objective 4.1d

Increase the number of innovative cost-saving ideas/entrepreneurial projects implemented. The institution will increase the number of innovative cost-saving ideas or entrepreneurial projects implemented annually by 25% over baseline by end of cycle.	
2004-05 Base Year Objective Baseline	27
2005-06 projected progress	5% increase over baseline.
2006-07 projected progress	10% increase over baseline.
2007-08 projected progress	15% increase over baseline.
2008-09 projected progress	20% increase over baseline.
2009-10 projected progress	25% increase over baseline.

Appendix F

IDEA Evaluation Instrument

http://www.idea.ksu.edu/

IDEA Long Form Page 1

IDEA CENTER

SURVEY FORM - STUDENT REACTIONS TO INSTRUCTION AND COURSES

IMPORTANT!

Proper Marks ●●●●●●

Improper Marks ⊙⊘⊗⊙◒⊕

Your thoughtful answers to these questions will provide helpful information to your instructor.

Describe the frequency of your instructor's teaching procedures, using the following code:
1=Hardly Ever 2=Occasionally 3=Sometimes 4=Frequently 5=Almost Always

The Instructor:

1.	①	②	③	④	⑤ Displayed a personal interest in students and their learning
2.	①	②	③	④	⑤ Found ways to help students answer their own questions
3.	①	②	③	④	⑤ Scheduled course work (class activities, tests, projects) in ways which encouraged students to stay up-to-date in their work
4.	①	②	③	④	⑤ Demonstrated the importance and significance of the subject matter
5.	①	②	③	④	⑤ Formed "teams" or "discussion groups" to facilitate learning
6.	①	②	③	④	⑤ Made it clear how each topic fit into the course
7.	①	②	③	④	⑤ Explained the reasons for criticisms of students' academic performance
8.	①	②	③	④	⑤ Stimulated students to intellectual effort beyond that required by most courses
9.	①	②	③	④	⑤ Encouraged students to use multiple resources (e.g. data banks, library holdings, outside experts) to improve understanding
10.	①	②	③	④	⑤ Explained course material clearly and concisely
11.	①	②	③	④	⑤ Related course material to real life situations
12.	①	②	③	④	⑤ Gave tests, projects, etc. that covered the most important points of the course
13.	①	②	③	④	⑤ Introduced stimulating ideas about the subject
14.	①	②	③	④	⑤ Involved students in "hands on" projects such as research, case studies, or "real life" activities
15.	①	②	③	④	⑤ Inspired students to set and achieve goals which really challenged them
16.	①	②	③	④	⑤ Asked students to share ideas and experiences with others whose backgrounds and viewpoints differ from their own
17.	①	②	③	④	⑤ Provided timely and frequent feedback on tests, reports, projects, etc. to help students improve
18.	①	②	③	④	⑤ Asked students to help each other understand ideas or concepts
19.	①	②	③	④	⑤ Gave projects, tests, or assignments that required original or creative thinking
20.	①	②	③	④	⑤ Encouraged student-faculty interaction outside of class (office visits, phone calls, e-mail, etc.)

Twelve possible learning objectives are listed below. For each, rate your progress in this course compared with your progress in other courses you have taken at this college or university. (Of course, ratings on objectives which were not addressed by the course will usually be low.)

In this course, my progress was:
1-Low (lowest 10 percent of courses I have taken here)
2-Low Average (next 20 percent of courses I have taken here)
3-Average (middle 40 percent of courses I have taken here)
4-High Average (next 20 percent of courses I have taken here)
5-High (highest 10 percent of courses I have taken here)

Progress on:

21.	①	②	③	④	⑤ Gaining factual knowledge (terminology, classifications, methods, trends)
22.	①	②	③	④	⑤ Learning fundamental principles, generalizations, or theories
23.	①	②	③	④	⑤ Learning to *apply* course material (to improve thinking, problem solving, and decisions)
24.	①	②	③	④	⑤ Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course
25.	①	②	③	④	⑤ Acquiring skills in working with others as a member of a team
26.	①	②	③	④	⑤ Developing creative capacities (writing, inventing, designing, performing in art, music, drama, etc.)
27.	①	②	③	④	⑤ Gaining a broader understanding and appreciation of intellectual/cultural activity (music, science, literature, etc.)
28.	①	②	③	④	⑤ Developing skill in expressing myself orally or in writing
29.	①	②	③	④	⑤ Learning how to find and use resources for answering questions or solving problems
30.	①	②	③	④	⑤ Developing a clearer understanding of, and commitment to, personal values
31.	①	②	③	④	⑤ Learning to *analyze* and *critically evaluate* ideas, arguments, and points of view
32.	①	②	③	④	⑤ Acquiring an interest in learning more by asking my own questions and seeking answers

IDEA Long Form Page 2

On the next three items, compare this course with others you have taken at this institution, using the following code:
1=Much Less than Most Courses 2=Less than Most Courses 3=About Average 4=More than Most Courses 5=Much More than Most Courses

The Course:

33. ① ② ③ ④ ⑤ Amount of reading
34. ① ② ③ ④ ⑤ Amount of work in other (non-reading) assignments
35. ① ② ③ ④ ⑤ Difficulty of subject matter

Describe your attitudes and behavior in this course, using the following code:
1=Definitely False 2=More False Than True 3=In Between 4=More True Than False 5=Definitely True

Self Rating:

36. ① ② ③ ④ ⑤ I had a strong desire to take this course.
37. ① ② ③ ④ ⑤ I worked harder on this course than on most courses I have taken.
38. ① ② ③ ④ ⑤ I really wanted to take a course from this instructor.
39. ① ② ③ ④ ⑤ I really wanted to take this course regardless of who taught it.
40. ① ② ③ ④ ⑤ As a result of taking this course, I have more positive feelings toward this field of study.
41. ① ② ③ ④ ⑤ Overall, I rate this instructor an excellent teacher.
42. ① ② ③ ④ ⑤ Overall, I rate this course as excellent.

For the following items, blacken the space which best corresponds to your judgment:
1=Definitely False 2=More False Than True 3=In Between 4=More True Than False 5=Definitely True

43. ① ② ③ ④ ⑤ As a rule, I put forth more effort than other students on academic work.
44. ① ② ③ ④ ⑤ The instructor used a variety of methods--not only tests--to evaluate student progress on course objectives.
45. ① ② ③ ④ ⑤ The instructor expected students to take their share of responsibility for learning.
46. ① ② ③ ④ ⑤ The instructor had high achievement standards in this class.
47. ① ② ③ ④ ⑤ The instructor used educational technology (e.g., Internet, e-mail, computer exercises, multi-media presentations, etc.) to promote learning.

EXTRA QUESTIONS

If your instructor has extra questions, answer them in the spaces designated below (questions 48-66):

48. ① ② ③ ④ ⑤
49. ① ② ③ ④ ⑤
50. ① ② ③ ④ ⑤
51. ① ② ③ ④ ⑤
52. ① ② ③ ④ ⑤
53. ① ② ③ ④ ⑤
54. ① ② ③ ④ ⑤
55. ① ② ③ ④ ⑤
56. ① ② ③ ④ ⑤
57. ① ② ③ ④ ⑤
58. ① ② ③ ④ ⑤
59. ① ② ③ ④ ⑤
60. ① ② ③ ④ ⑤
61. ① ② ③ ④ ⑤
62. ① ② ③ ④ ⑤
63. ① ② ③ ④ ⑤
64. ① ② ③ ④ ⑤
65. ① ② ③ ④ ⑤
66. ① ② ③ ④ ⑤

Your comments are invited on how the instructor might improve this course or teaching procedures. Use the space below for comments (unless otherwise directed). *Note: Your written comments may be returned to the instructor. You may want to PRINT to protect your anonymity.*

Institution: Instructor:

Course Number: Time and Days Class Meets:

Comments: _____

IDEA Short Form

SHORT FORM - STUDENT REACTIONS TO INSTRUCTION AND COURSES

IDEA CENTER

Institution: Instructor:

Course Number: Time and Days Class Meets:

IMPORTANT!

Proper Marks ●●●●●●

Improper Marks ⊙⊘⊗⊙◒⊕

Twelve possible learning objectives are listed below. For each, rate your progress in this course compared with your progress in other courses you have taken at this college or university. (Of course, ratings on objectives which were not addressed by the course will usually be low.)

In this course, my progress on this objective was:
1-Low (lowest 10 percent of courses I have taken here)
2-Low Average (next 20 percent of courses I have taken here)
3-Average (middle 40 percent of courses I have taken here)
4-High Average (next 20 percent of courses I have taken here)
5-High (highest 10 percent of courses I have taken here)

Progress on:

1.	①	②	③	④	⑤	Gaining factual knowledge (terminology, classifications, methods, trends)
2.	①	②	③	④	⑤	Learning fundamental principles, generalizations, or theories
3.	①	②	③	④	⑤	Learning to *apply* course material (to improve thinking, problem solving, and decisions)
4.	①	②	③	④	⑤	Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course
5.	①	②	③	④	⑤	Acquiring skills in working with others as a member of a team
6.	①	②	③	④	⑤	Developing creative capacities (writing, inventing, designing, performing in art, music, drama, etc.)
7.	①	②	③	④	⑤	Gaining a broader understanding and appreciation of intellectual/cultural activity (music, science, literature, etc.)
8.	①	②	③	④	⑤	Developing skill in expressing myself orally or in writing
9.	①	②	③	④	⑤	Learning how to find and use resources for answering questions or solving problems
10.	①	②	③	④	⑤	Developing a clearer understanding of, and commitment to, personal values
11.	①	②	③	④	⑤	Learning to *analyze* and *critically evaluate* ideas, arguments, and points of view
12.	①	②	③	④	⑤	Acquiring an interest in learning more by asking my own questions and seeking answers

Sample

For the remaining questions, use the following code:
1=Definitely False 2=More False Than True 3=In Between 4=More True Than False 5=Definitely True

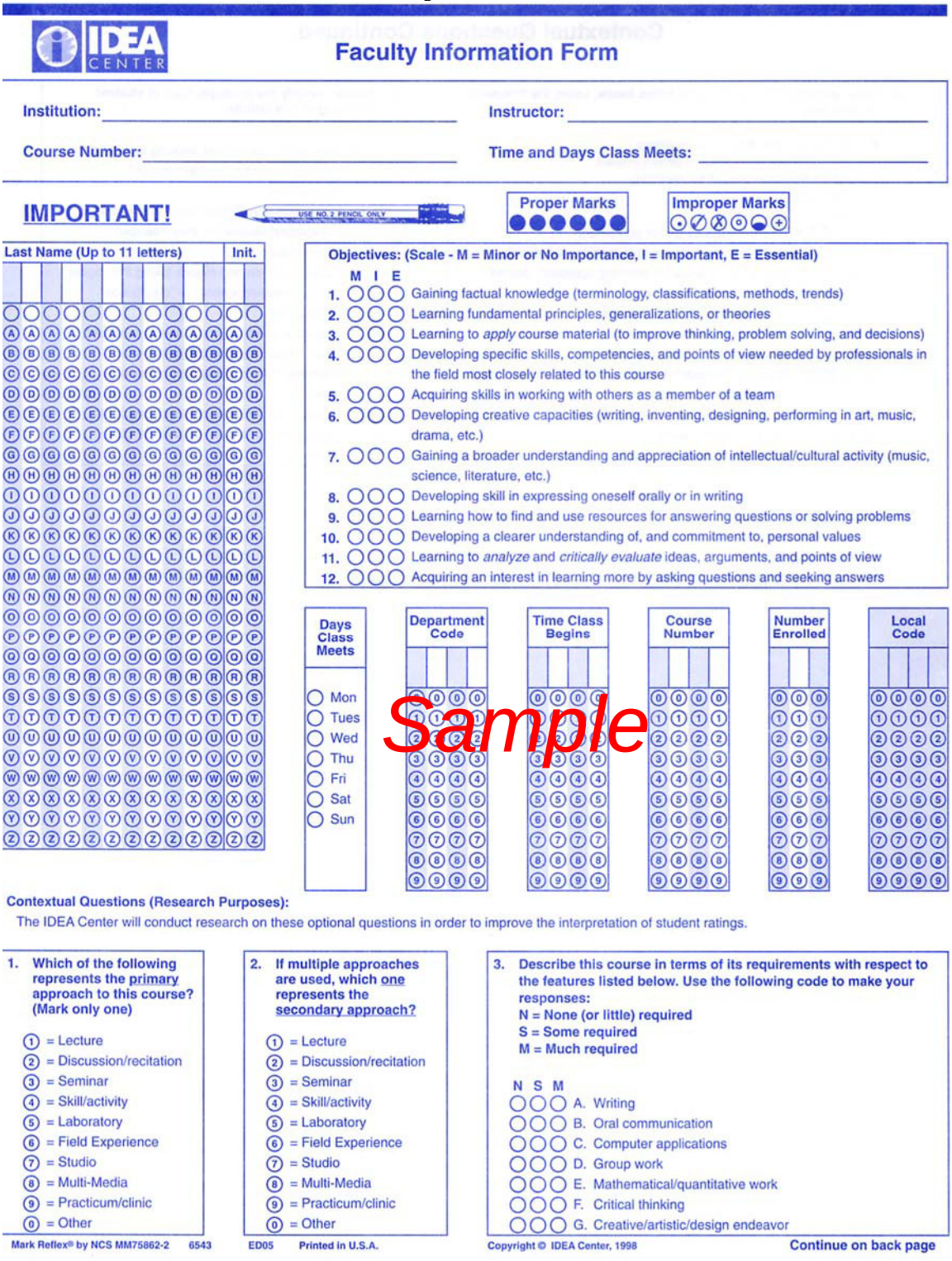
13.	①	②	③	④	⑤	As a rule, I put forth more effort than other students on academic work.
14.	①	②	③	④	⑤	My background prepared me well for this course's requirements.
15.	①	②	③	④	⑤	I really wanted to take this course regardless of who taught it.
16.	①	②	③	④	⑤	As a result of taking this course, I have more positive feelings toward this field of study.
17.	①	②	③	④	⑤	Overall, I rate this instructor an excellent teacher.
18.	①	②	③	④	⑤	Overall, I rate this course as excellent.

EXTRA QUESTIONS
If your instructor has extra questions, answer them in the space designated below (questions 19-28).

19.	①	②	③	④	⑤	24.	①	②	③	④	⑤
20.	①	②	③	④	⑤	25.	①	②	③	④	⑤
21.	①	②	③	④	⑤	26.	①	②	③	④	⑤
22.	①	②	③	④	⑤	27.	①	②	③	④	⑤
23.	①	②	③	④	⑤	28.	①	②	③	④	⑤

Your comments are invited on how the instructor might improve this course or teaching procedures. Use the space provided on the back of this form for your comments.

IDEA Faculty Information Form



IDEA CENTER

Faculty Information Form

Institution: _____ Instructor: _____

Course Number: _____ Time and Days Class Meets: _____

IMPORTANT! USE NO. 2 PENCIL ONLY

Proper Marks ●●●●●●

Improper Marks ⊙⊘⊗⊙◒⊕

Last Name (Up to 11 letters) | Init.

Objectives: (Scale - M = Minor or No Importance, I = Important, E = Essential)

M I E

1. Gaining factual knowledge (terminology, classifications, methods, trends)
2. Learning fundamental principles, generalizations, or theories
3. Learning to *apply* course material (to improve thinking, problem solving, and decisions)
4. Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course
5. Acquiring skills in working with others as a member of a team
6. Developing creative capacities (writing, inventing, designing, performing in art, music, drama, etc.)
7. Gaining a broader understanding and appreciation of intellectual/cultural activity (music, science, literature, etc.)
8. Developing skill in expressing oneself orally or in writing
9. Learning how to find and use resources for answering questions or solving problems
10. Developing a clearer understanding of, and commitment to, personal values
11. Learning to *analyze* and *critically evaluate* ideas, arguments, and points of view
12. Acquiring an interest in learning more by asking questions and seeking answers

Days Class Meets: Mon, Tues, Wed, Thu, Fri, Sat, Sun

Department Code | Time Class Begins | Course Number | Number Enrolled | Local Code

Sample

Contextual Questions (Research Purposes):

The IDEA Center will conduct research on these optional questions in order to improve the interpretation of student ratings.

1. **Which of the following represents the primary approach to this course? (Mark only one)**

   (1) = Lecture
   (2) = Discussion/recitation
   (3) = Seminar
   (4) = Skill/activity
   (5) = Laboratory
   (6) = Field Experience
   (7) = Studio
   (8) = Multi-Media
   (9) = Practicum/clinic
   (0) = Other

2. **If multiple approaches are used, which one represents the secondary approach?**

   (1) = Lecture
   (2) = Discussion/recitation
   (3) = Seminar
   (4) = Skill/activity
   (5) = Laboratory
   (6) = Field Experience
   (7) = Studio
   (8) = Multi-Media
   (9) = Practicum/clinic
   (0) = Other

3. **Describe this course in terms of its requirements with respect to the features listed below. Use the following code to make your responses:**
   N = None (or little) required
   S = Some required
   M = Much required

   N S M
   A. Writing
   B. Oral communication
   C. Computer applications
   D. Group work
   E. Mathematical/quantitative work
   F. Critical thinking
   G. Creative/artistic/design endeavor

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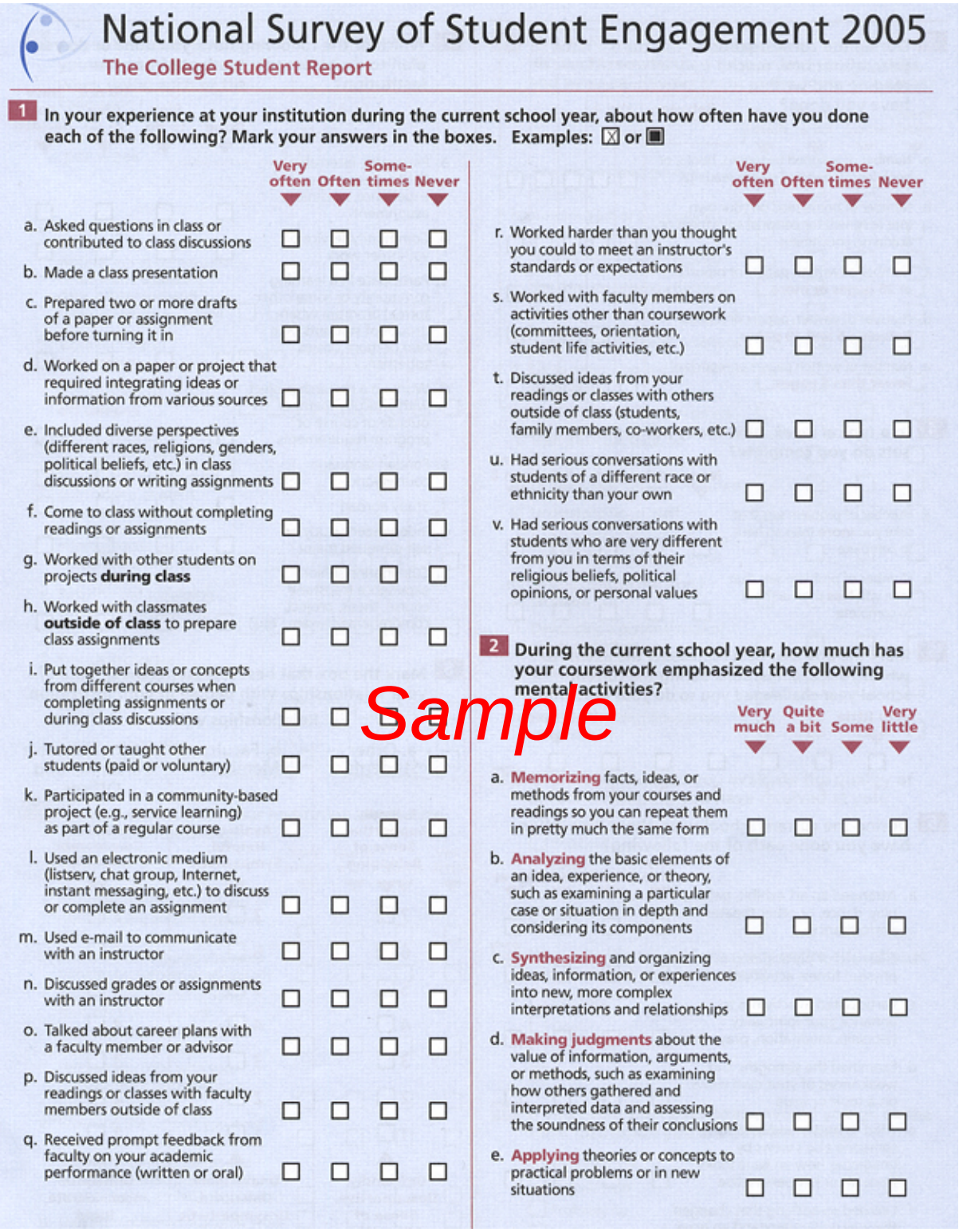
Continue on back page

Appendix G



National Survey of Student Engagement 2005

The College Student Report

1 In your experience at your institution during the current school year, about how often have you done each of the following? Mark your answers in the boxes. Examples: ☒ or ■

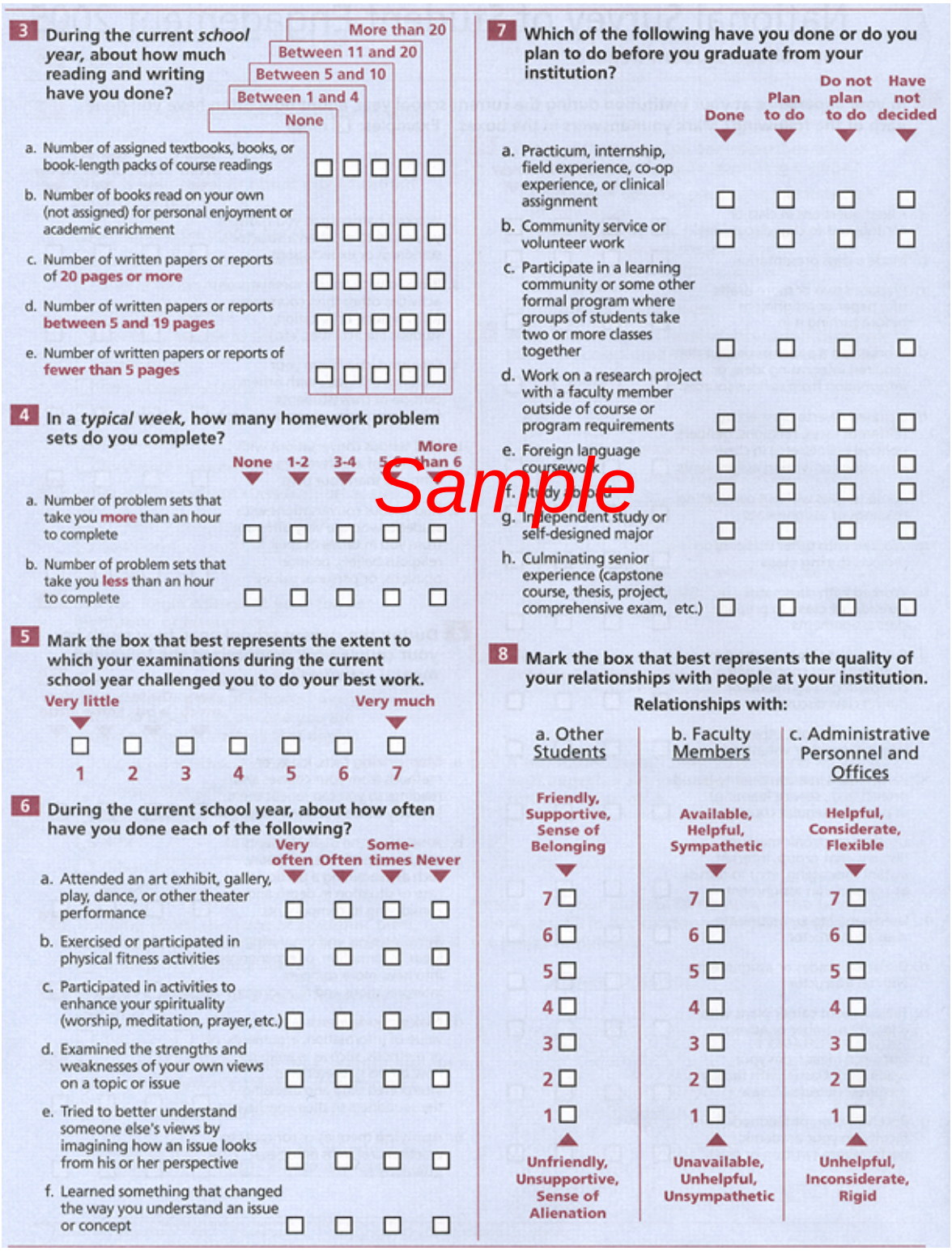
	Very often	Often	Some-times	Never
a. Asked questions in class or contributed to class discussions	☐	☐	☐	☐
b. Made a class presentation	☐	☐	☐	☐
c. Prepared two or more drafts of a paper or assignment before turning it in	☐	☐	☐	☐
d. Worked on a paper or project that required integrating ideas or information from various sources	☐	☐	☐	☐
e. Included diverse perspectives (different races, religions, genders, political beliefs, etc.) in class discussions or writing assignments	☐	☐	☐	☐
f. Come to class without completing readings or assignments	☐	☐	☐	☐
g. Worked with other students on projects **during class**	☐	☐	☐	☐
h. Worked with classmates **outside of class** to prepare class assignments	☐	☐	☐	☐
i. Put together ideas or concepts from different courses when completing assignments or during class discussions	☐	☐	☐	☐
j. Tutored or taught other students (paid or voluntary)	☐	☐	☐	☐
k. Participated in a community-based project (e.g., service learning) as part of a regular course	☐	☐	☐	☐
l. Used an electronic medium (listserv, chat group, Internet, instant messaging, etc.) to discuss or complete an assignment	☐	☐	☐	☐
m. Used e-mail to communicate with an instructor	☐	☐	☐	☐
n. Discussed grades or assignments with an instructor	☐	☐	☐	☐
o. Talked about career plans with a faculty member or advisor	☐	☐	☐	☐
p. Discussed ideas from your readings or classes with faculty members outside of class	☐	☐	☐	☐
q. Received prompt feedback from faculty on your academic performance (written or oral)	☐	☐	☐	☐
r. Worked harder than you thought you could to meet an instructor's standards or expectations	☐	☐	☐	☐
s. Worked with faculty members on activities other than coursework (committees, orientation, student life activities, etc.)	☐	☐	☐	☐
t. Discussed ideas from your readings or classes with others outside of class (students, family members, co-workers, etc.)	☐	☐	☐	☐
u. Had serious conversations with students of a different race or ethnicity than your own	☐	☐	☐	☐
v. Had serious conversations with students who are very different from you in terms of their religious beliefs, political opinions, or personal values	☐	☐	☐	☐

2 During the current school year, how much has your coursework emphasized the following mental activities?

	Very much	Quite a bit	Some	Very little
a. **Memorizing** facts, ideas, or methods from your courses and readings so you can repeat them in pretty much the same form	☐	☐	☐	☐
b. **Analyzing** the basic elements of an idea, experience, or theory, such as examining a particular case or situation in depth and considering its components	☐	☐	☐	☐
c. **Synthesizing** and organizing ideas, information, or experiences into new, more complex interpretations and relationships	☐	☐	☐	☐
d. **Making judgments** about the value of information, arguments, or methods, such as examining how others gathered and interpreted data and assessing the soundness of their conclusions	☐	☐	☐	☐
e. **Applying** theories or concepts to practical problems or in new situations	☐	☐	☐	☐

Sample

NSSE Page 2



3 During the current *school year*, about how much reading and writing have you done?

	None	Between 1 and 4	Between 5 and 10	Between 11 and 20	More than 20
a. Number of assigned textbooks, books, or book-length packs of course readings	☐	☐	☐	☐	☐
b. Number of books read on your own (not assigned) for personal enjoyment or academic enrichment	☐	☐	☐	☐	☐
c. Number of written papers or reports of **20 pages or more**	☐	☐	☐	☐	☐
d. Number of written papers or reports **between 5 and 19 pages**	☐	☐	☐	☐	☐
e. Number of written papers or reports of **fewer than 5 pages**	☐	☐	☐	☐	☐

4 In a *typical week*, how many homework problem sets do you complete?

	None	1-2	3-4	5-6	More than 6
a. Number of problem sets that take you **more** than an hour to complete	☐	☐	☐	☐	☐
b. Number of problem sets that take you **less** than an hour to complete	☐	☐	☐	☐	☐

5 Mark the box that best represents the extent to which your examinations during the current school year challenged you to do your best work.

Very little ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very much

1 2 3 4 5 6 7

6 During the current school year, about how often have you done each of the following?

	Very often	Often	Some-times	Never
a. Attended an art exhibit, gallery, play, dance, or other theater performance	☐	☐	☐	☐
b. Exercised or participated in physical fitness activities	☐	☐	☐	☐
c. Participated in activities to enhance your spirituality (worship, meditation, prayer, etc.)	☐	☐	☐	☐
d. Examined the strengths and weaknesses of your own views on a topic or issue	☐	☐	☐	☐
e. Tried to better understand someone else's views by imagining how an issue looks from his or her perspective	☐	☐	☐	☐
f. Learned something that changed the way you understand an issue or concept	☐	☐	☐	☐

7 Which of the following have you done or do you plan to do before you graduate from your institution?

	Done	Plan to do	Do not plan to do	Have not decided
a. Practicum, internship, field experience, co-op experience, or clinical assignment	☐	☐	☐	☐
b. Community service or volunteer work	☐	☐	☐	☐
c. Participate in a learning community or some other formal program where groups of students take two or more classes together	☐	☐	☐	☐
d. Work on a research project with a faculty member outside of course or program requirements	☐	☐	☐	☐
e. Foreign language coursework	☐	☐	☐	☐
f. Study abroad	☐	☐	☐	☐
g. Independent study or self-designed major	☐	☐	☐	☐
h. Culminating senior experience (capstone course, thesis, project, comprehensive exam, etc.)	☐	☐	☐	☐

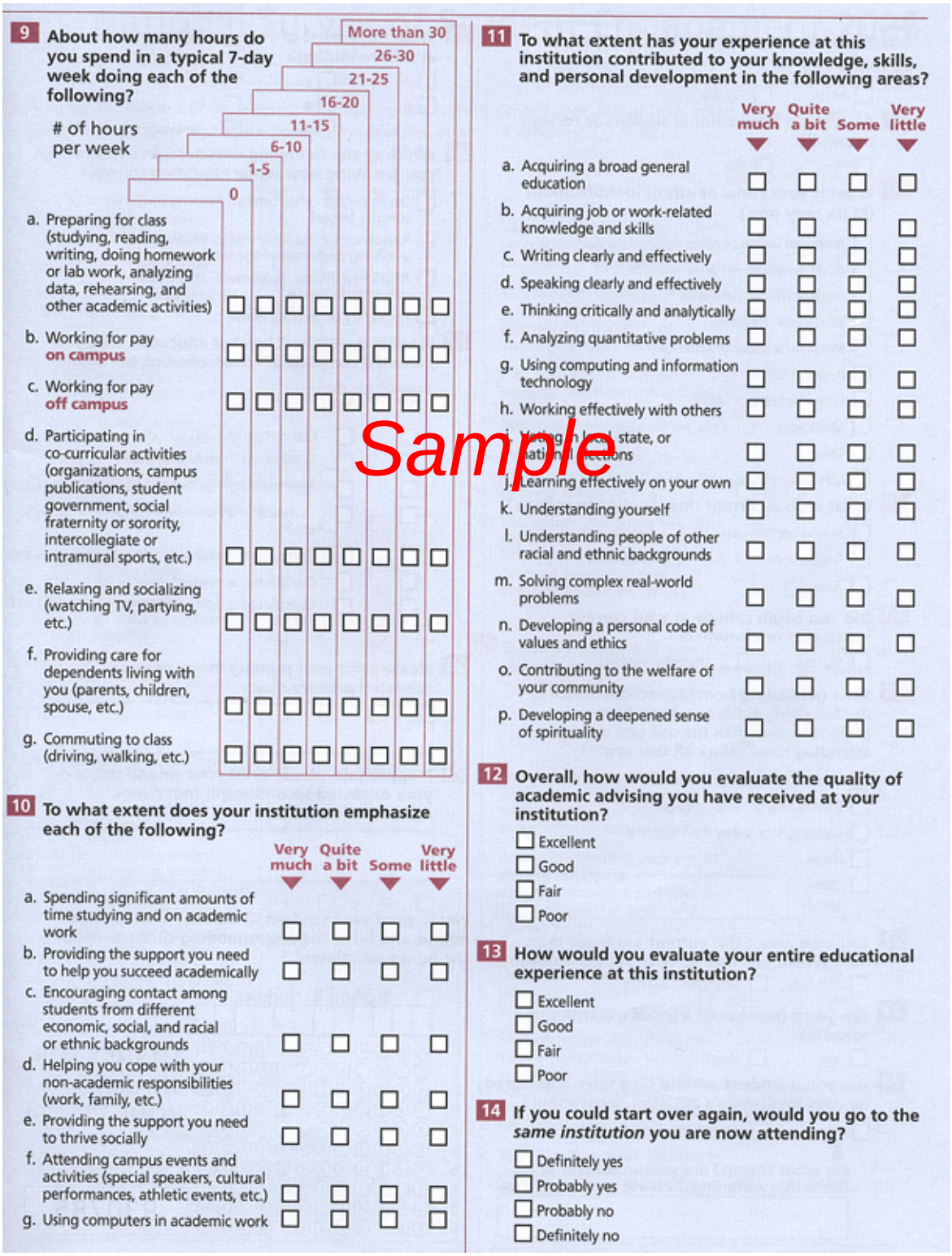
Sample

8 Mark the box that best represents the quality of your relationships with people at your institution.

Relationships with:

a. Other Students	b. Faculty Members	c. Administrative Personnel and Offices
Friendly, Supportive, Sense of Belonging	Available, Helpful, Sympathetic	Helpful, Considerate, Flexible
7 ☐	7 ☐	7 ☐
6 ☐	6 ☐	6 ☐
5 ☐	5 ☐	5 ☐
4 ☐	4 ☐	4 ☐
3 ☐	3 ☐	3 ☐
2 ☐	2 ☐	2 ☐
1 ☐	1 ☐	1 ☐
Unfriendly, Unsupportive, Sense of Alienation	Unavailable, Unhelpful, Unsympathetic	Unhelpful, Inconsiderate, Rigid

NSSE Page 3



9 About how many hours do you spend in a typical 7-day week doing each of the following?

# of hours per week	0	1-5	6-10	11-15	16-20	21-25	26-30	More than 30
a. Preparing for class (studying, reading, writing, doing homework or lab work, analyzing data, rehearsing, and other academic activities)	☐	☐	☐	☐	☐	☐	☐	☐
b. Working for pay **on campus**	☐	☐	☐	☐	☐	☐	☐	☐
c. Working for pay **off campus**	☐	☐	☐	☐	☐	☐	☐	☐
d. Participating in co-curricular activities (organizations, campus publications, student government, social fraternity or sorority, intercollegiate or intramural sports, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
e. Relaxing and socializing (watching TV, partying, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
f. Providing care for dependents living with you (parents, children, spouse, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
g. Commuting to class (driving, walking, etc.)	☐	☐	☐	☐	☐	☐	☐	☐

10 To what extent does your institution emphasize each of the following?

	Very much	Quite a bit	Some	Very little
a. Spending significant amounts of time studying and on academic work	☐	☐	☐	☐
b. Providing the support you need to help you succeed academically	☐	☐	☐	☐
c. Encouraging contact among students from different economic, social, and racial or ethnic backgrounds	☐	☐	☐	☐
d. Helping you cope with your non-academic responsibilities (work, family, etc.)	☐	☐	☐	☐
e. Providing the support you need to thrive socially	☐	☐	☐	☐
f. Attending campus events and activities (special speakers, cultural performances, athletic events, etc.)	☐	☐	☐	☐
g. Using computers in academic work	☐	☐	☐	☐

11 To what extent has your experience at this institution contributed to your knowledge, skills, and personal development in the following areas?

	Very much	Quite a bit	Some	Very little
a. Acquiring a broad general education	☐	☐	☐	☐
b. Acquiring job or work-related knowledge and skills	☐	☐	☐	☐
c. Writing clearly and effectively	☐	☐	☐	☐
d. Speaking clearly and effectively	☐	☐	☐	☐
e. Thinking critically and analytically	☐	☐	☐	☐
f. Analyzing quantitative problems	☐	☐	☐	☐
g. Using computing and information technology	☐	☐	☐	☐
h. Working effectively with others	☐	☐	☐	☐
i. Voting in local, state, or national elections	☐	☐	☐	☐
j. Learning effectively on your own	☐	☐	☐	☐
k. Understanding yourself	☐	☐	☐	☐
l. Understanding people of other racial and ethnic backgrounds	☐	☐	☐	☐
m. Solving complex real-world problems	☐	☐	☐	☐
n. Developing a personal code of values and ethics	☐	☐	☐	☐
o. Contributing to the welfare of your community	☐	☐	☐	☐
p. Developing a deepened sense of spirituality	☐	☐	☐	☐

12 Overall, how would you evaluate the quality of academic advising you have received at your institution?

☐ Excellent
☐ Good
☐ Fair
☐ Poor

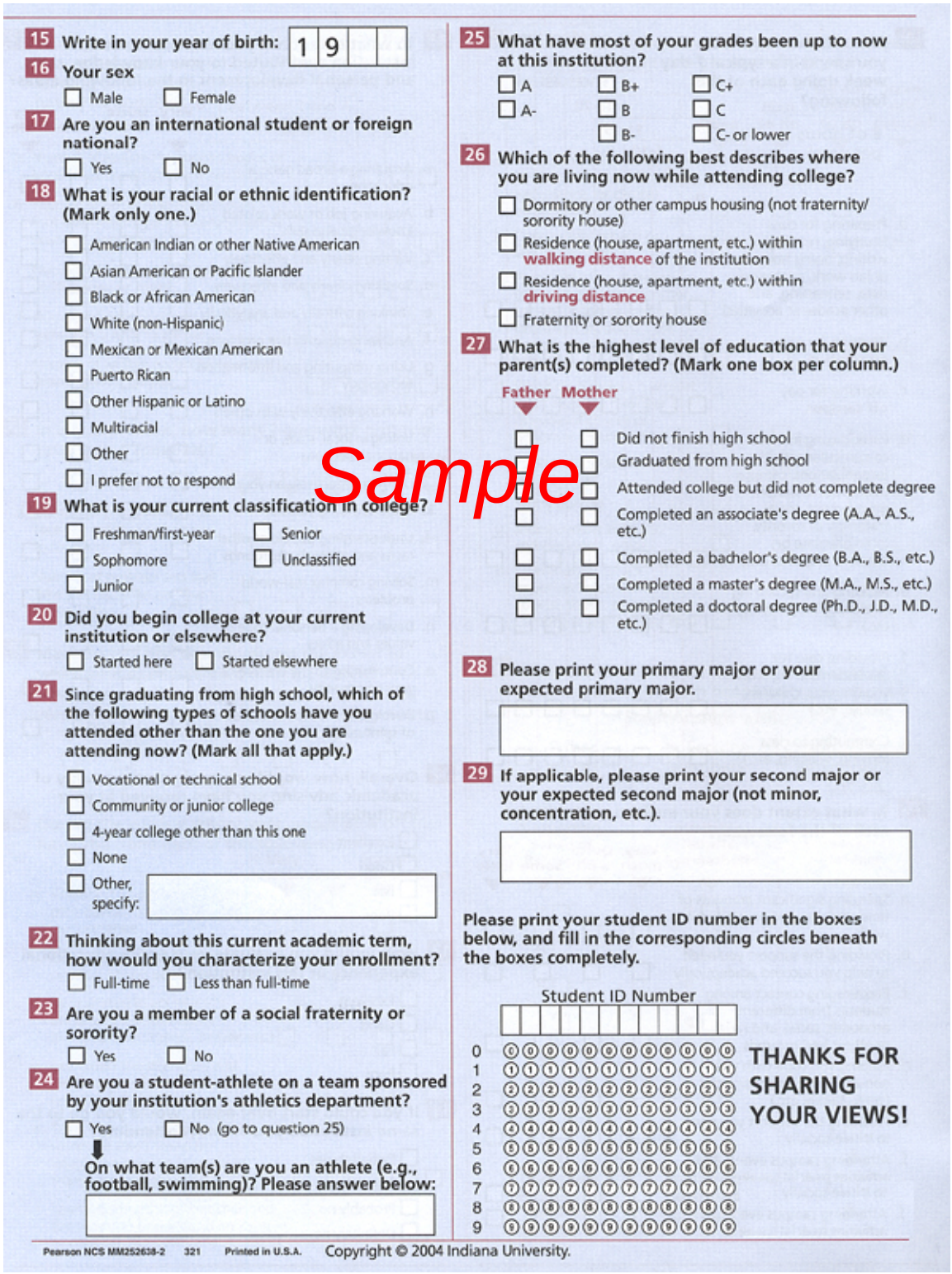
13 How would you evaluate your entire educational experience at this institution?

☐ Excellent
☐ Good
☐ Fair
☐ Poor

14 If you could start over again, would you go to the *same institution* you are now attending?

☐ Definitely yes
☐ Probably yes
☐ Probably no
☐ Definitely no

NSSE Page 4



15 Write in your year of birth: 1 9

16 Your sex
- ☐ Male
- ☐ Female

17 Are you an international student or foreign national?
- ☐ Yes
- ☐ No

18 What is your racial or ethnic identification? (Mark only one.)
- ☐ American Indian or other Native American
- ☐ Asian American or Pacific Islander
- ☐ Black or African American
- ☐ White (non-Hispanic)
- ☐ Mexican or Mexican American
- ☐ Puerto Rican
- ☐ Other Hispanic or Latino
- ☐ Multiracial
- ☐ Other
- ☐ I prefer not to respond

19 What is your current classification in college?
- ☐ Freshman/first-year
- ☐ Sophomore
- ☐ Junior
- ☐ Senior
- ☐ Unclassified

20 Did you begin college at your current institution or elsewhere?
- ☐ Started here
- ☐ Started elsewhere

21 Since graduating from high school, which of the following types of schools have you attended other than the one you are attending now? (Mark all that apply.)
- ☐ Vocational or technical school
- ☐ Community or junior college
- ☐ 4-year college other than this one
- ☐ None
- ☐ Other, specify:

22 Thinking about this current academic term, how would you characterize your enrollment?
- ☐ Full-time
- ☐ Less than full-time

23 Are you a member of a social fraternity or sorority?
- ☐ Yes
- ☐ No

24 Are you a student-athlete on a team sponsored by your institution's athletics department?
- ☐ Yes
- ☐ No (go to question 25)

On what team(s) are you an athlete (e.g., football, swimming)? Please answer below:

25 What have most of your grades been up to now at this institution?
- ☐ A
- ☐ A-
- ☐ B+
- ☐ B
- ☐ B-
- ☐ C+
- ☐ C
- ☐ C- or lower

26 Which of the following best describes where you are living now while attending college?
- ☐ Dormitory or other campus housing (not fraternity/sorority house)
- ☐ Residence (house, apartment, etc.) within walking distance of the institution
- ☐ Residence (house, apartment, etc.) within driving distance
- ☐ Fraternity or sorority house

27 What is the highest level of education that your parent(s) completed? (Mark one box per column.)

Father	Mother	
☐	☐	Did not finish high school
☐	☐	Graduated from high school
☐	☐	Attended college but did not complete degree
☐	☐	Completed an associate's degree (A.A., A.S., etc.)
☐	☐	Completed a bachelor's degree (B.A., B.S., etc.)
☐	☐	Completed a master's degree (M.A., M.S., etc.)
☐	☐	Completed a doctoral degree (Ph.D., J.D., M.D., etc.)

28 Please print your primary major or your expected primary major.

29 If applicable, please print your second major or your expected second major (not minor, concentration, etc.).

Please print your student ID number in the boxes below, and fill in the corresponding circles beneath the boxes completely.

Student ID Number

0 1 2 3 4 5 6 7 8 9

THANKS FOR SHARING YOUR VIEWS!

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Sample

Appendix H
TTU CAT Instrument
2000 - 2005 Summary Report

Background

Tennessee Tech University began a pilot program during the 2000-2001 academic year to evaluate critical thinking skills of graduating seniors. During the 2000-2001 academic year approximately 200 seniors were given the *Tasks in Critical Thinking* Test developed by the Educational Testing Service (ETS). The students given the test were selected using a stratified random sample of seniors from four colleges at the University (education, arts & sciences, business, and engineering).

Tennessee Tech University selected the ETS test because it was an essay test and could involve faculty in the scoring and discussion of student responses. Such faculty involvement was seen as an essential ingredient in any subsequent efforts to encourage faculty to modify their teaching to improve critical thinking. Many faculty involved in the first scoring workshop gained insight into student deficiencies in critical thinking and discussed the need to modify their teaching approaches to provide students with more opportunities to develop critical thinking skills.

Three factors played an important role in our decision to stop using the ETS test and explore other means of evaluating critical thinking skills. Our statistical analysis of the test results and feedback from faculty involved in the scoring of the test raised serious questions about the validity of the test. Specifically, a variety of ambiguous and perhaps faulty guidelines for scoring responses reflected a failure to adequately refine the test. Secondly, while the test measured some aspects of critical thinking, it was neither comprehensive nor thorough. That is, many important areas of critical thinking were not addressed by the test, and those that were may not have been thoroughly and accurately assessed. Specifically, we found many questions simply asked students to restate ideas that were provided in the reading material without requiring any significant evaluation or critical analysis. We also found little evidence to corroborate the validity of the test when we examined the correlation between the ETS test scores and other measures of student achievement such as the ACT Test or cumulative grade point average. Finally, ETS informed us that they were removing it from the testing market so it would not be available for further use later that year.

We examined several alternative objective tests that had been developed to evaluate critical thinking. None of these tests involved faculty in the scoring of exams, and most of these exams operationally defined critical thinking in a very narrow way. Specifically, the objective tests focus almost exclusively on verbal, categorical, analogical, and hypothetical-deductive reasoning. While many faculty members think these skills are important, they also associate the teaching of those formal reasoning skills with courses in logic, mathematics, or formal problem solving. Consequently, the use of such tests as an assessment tool does not encourage broad faculty involvement in the development of critical thinking skills.

In order to encourage faculty involvement in not only the assessment of critical thinking, but also in the improvement of critical thinking skills, TTU embarked on an ambitious plan of having small groups of faculty work together to identify and develop an assessment tool for measuring critical thinking. The underlying idea was to increase faculty involvement and interest in developing critical thinking by identifying critical thinking skills that they themselves thought were important for their own students. Developing their own tests would give them a vested interest in the outcomes.

This effort began with an attempt to analyze what faculty liked about the previously used ETS exam and what they did not. Although the ETS test had numerous problems, the faculty involved in the first workshop generally thought that this type of test measured something important about students' abilities to evaluate and analyze new information. The fact that the test involved information that the students had never seen before was considered important. The fact that the test required students to analyze and evaluate information and form conclusions was also regarded as important. An additional feature that was deemed important by some faculty members is that some of the tests asked students to determine what additional information they might need to further evaluate the issue under consideration. These

observations became the starting point for developing a new test of critical thinking that would have high face validity and would, we hoped, correlate with other measures of student achievement.

During the 2001-2002 year TTU developed and pilot tested its first critical thinking test. Three groups of faculty worked in teams and as members of a larger group to identify important critical thinking skills and develop questions/materials that would measure those skills. The test relied heavily on essay answers to help assess communication skills (as well as critical thinking skills) and leave opportunities for creative answers to questions that don't always have a single correct response. The essay format also involved faculty in the scoring of exams and helped promote more interest in improving critical thinking skills. In addition, the test was based on topics that the faculty thought students would find intrinsically interesting. The latter decision derived, in part, from observations of some students' unwillingness to participate seriously in the previously administered ETS exam because they found the topics irrelevant to their interests and academic focus. The tests also involved some elements of "dynamic assessment," a procedure whereby students are given opportunities to learn and then use that newly acquired knowledge in new situations. Tests which do not use dynamic assessment measure what a student has already learned and not their potential to master new ideas and content.

Key Areas/Skills Targeted for Assessment

1. Ability to interpret numerical relationships in graphs.
2. Ability to identify inappropriate conclusions and understand the limitations of correlational data.
3. Ability to identify evidence that might support or contradict a hypothesis.
4. Ability to identify new information that is needed to draw conclusions.
5. Ability to separate relevant from irrelevant information when solving a problem.
6. Ability to learn and understand information in an unfamiliar domain.
7. Ability to use elementary mathematics skills in the context of solving a larger real-world problem.
8. Ability to draw inferences between separate pieces of information and formulate conclusions.
9. Ability to recognize how new information might change the solution to a problem.
10. Ability to communicate effectively.

The locally developed test (CAT) was administered to a stratified random sample of seniors at TTU. A subset of that sample also took the California Critical Thinking Skills Test (CCTST) to help evaluate criterion validity. The results of that first pilot test were very encouraging. The TTU test had high criterion validity when compared to CCTST scores (r = .645) and ACT scores (r = .659) scores. In addition, the test appeared to have high face validity and provided a good range of test scores with no ceiling or floor effects and a distribution that was reasonably close to a "normal" distribution.

During the 2002 – 2003 academic year, TTU continued the refinement and testing of the CAT critical thinking test. During the fall semester of 2002, approximately 200 TTU freshman and senior level students were evaluated with the CAT Critical Thinking Test. The freshman and senior TTU students were both selected using a stratified random sample from the Colleges of Arts & Sciences, Business, Education, and Engineering. Composite ACT score was used as a covariate to adjust for any potential differences between freshman and senior's entering ACT score. The results revealed a significant increase in critical thinking test scores from the freshman to the senior class (p < .001). The CAT test was also administered within several classes using a pretest/posttest design. The test results revealed significant gains in one course that focused on critical thinking/problem solving but not another comparable course that was offered at the same time in the social sciences (both courses were junior level social science courses). The pattern of results discussed above provides evidence that the CAT test is sensitive to gains in critical thinking skills that may accrue from four years of college education and to gains in critical thinking skills that are associated with a single course in critical thinking/problem solving.

During the 2003 – 2004 academic year, TTU continued the refinement and testing of the CAT critical thinking test. Specifically, we examined how performance on the CAT instrument would compare to performance on the Academic Profile Test (ETS) using the short form. A stratified random sample of seniors took both the CAT instrument and the Academic Profile Test. We examined the correlation between scores on the Academic Profile Test, CAT instrument, and entering ACT score. As can be seen

in Table 1, the CAT scores are significantly correlated with both the Academic Profile Test scores and the entering ACT scores at approximately the same magnitude. The Academic Profile Test has a slightly higher correlation with the students' entering ACT score. The latter difference probably reflects the fact that the ACT and the Academic Profile Test have considerable overlap in the skills being evaluated. The magnitude of the correlation between the CAT Score and the Academic Profile Test Score provides additional support for the criterion validity of the CAT instrument while also demonstrating that the CAT instrument measures something different from either the Academic Profile Test or the ACT.

Table 1
Correlation Matrix

	TTU CAT Instrument	Entering ACT Score
Academic Profile Test	.558	.693
TTU CAT Instrument		.599

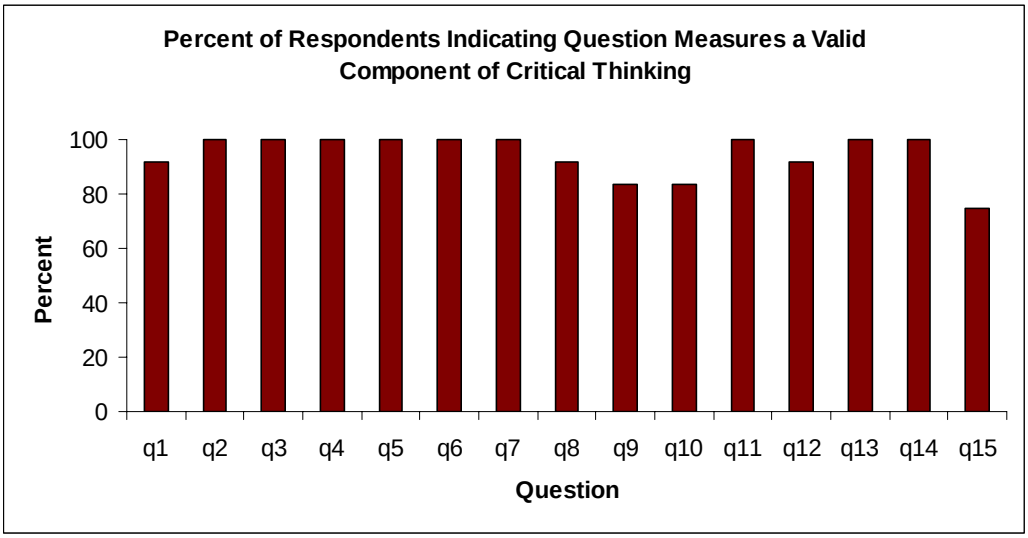
(all correlations significant, $p < .01$)

In our continuing efforts to improve the CAT instrument, we also examine scoring reliability since this has been problematic for many subjectively scored essay tests. Each question is scored by a minimum of two independent evaluators. If these two evaluators do not agree the question is scored by a third evaluator. To evaluate the reliability of scoring, the correlation between first and second evaluator scores for each question is calculated. In the most recent analysis, the average correlation for all questions was .87 which reflects positively on our continuing efforts to improve the test and the scoring criteria.

TTU also submitted a proposal to present a concurrent session at the 2003 SACS/COC annual convention in Nashville that would review TTU's efforts to develop a critical thinking test. This proposal was accepted, and the presentation in December of 2003 was both well attended (standing room only) and enthusiastically received. There appears to be considerable interest in finding better ways to assess critical thinking and in increasing faculty interest and involvement in the process. We received numerous requests for additional information as a result of the SACS presentation.

In the spring of 2004, TTU collaborated with the University of Memphis to administer and score the CAT instrument on their campus. The University of Memphis administered the CAT instrument to a random sample of approximately 130 seniors. Dr. Barry Stein from TTU provided assistance to an interdisciplinary team of faculty at the University of Memphis who scored the test. At the conclusion of the test scoring, faculty were encouraged to discuss their observations and to complete a survey to determine the extent to which each question measured a valid component of critical thinking. The results of the survey are summarized in Figure 1. These ratings reveal that the University of Memphis faculty who participated in the workshop generally considered the questions to measure valid components of critical thinking. These ratings provide additional support for the face validity of the CAT instrument.

Figure 1
Percent of Respondents Judging Questions as Valid
University of Memphis



The scoring workshop at the University of Memphis also provided a good opportunity to evaluate the reliability of scoring for the CAT instrument by people who had no prior experience with the test. Each question is scored by a minimum of two independent evaluators. If these two evaluators do not agree, the question is scored by a third evaluator. To evaluate the reliability of scoring, the correlation between first and second evaluator scores for each question is calculated. The average correlation for all questions was .85 at Memphis and compares favorably with correlations ranging from .83 to .87 observed at TTU.

2004-2005 Year

Overview

During the current academic year, TTU has continued to refine and test the CAT critical thinking instrument. The University received a three-year grant from the National Science Foundation to further refine the CAT instrument with input from six other universities across the country. In addition, TTU began to explore relationships between the widely used National Survey of Student Engagement (NSSE) and performance on the CAT instrument. The University's efforts to develop an effective tool for assessing critical thinking have also set the stage for the University's Quality Enhancement Plan that will involve the campus in efforts to improve critical thinking and real-world problem solving through the use of active learning strategies.

NSF Grant Activities & Findings Related to the CAT Instrument

TTU received a three-year $499,994 NSF grant to work with six other institutions across the country to refine the CAT instrument this year (www.tntech.edu/cat).

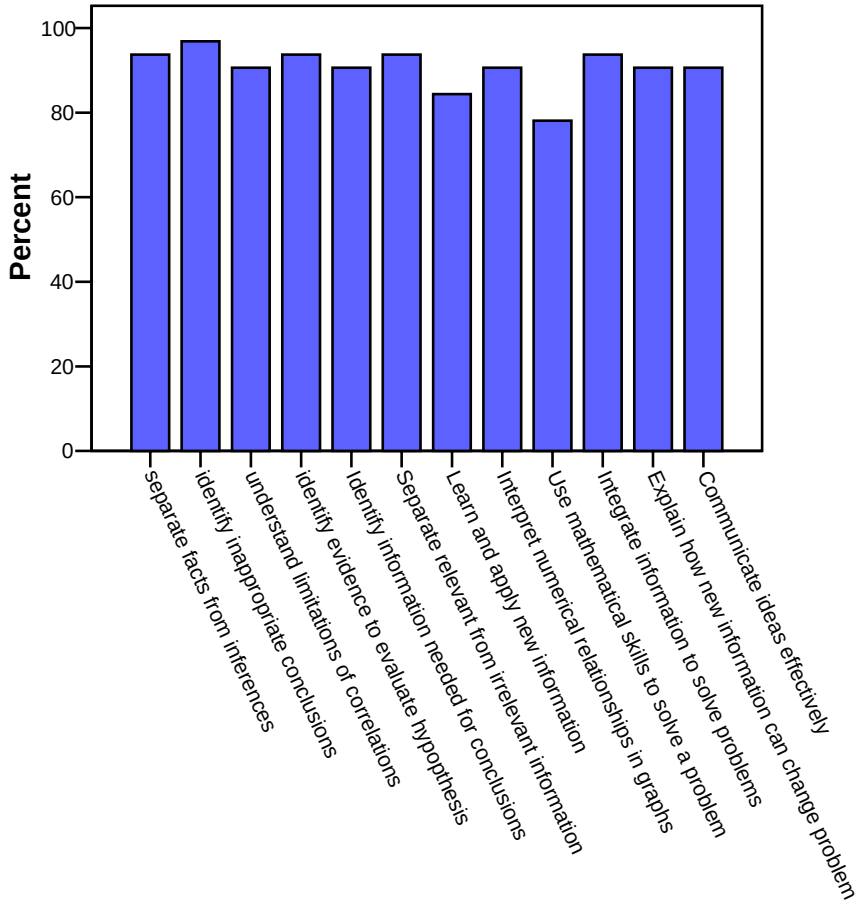
- The University of Texas
- The University of Washington
- The University of Colorado
- The University of Hawaii
- Howard University
- The University of Southern Maine

During the first year of the grant, TTU worked with the University of Hawaii, the University of Southern Maine, and The University of Texas to administer and score the tests using local faculty graders. These faculty members provided detailed feedback about the test and the scoring process. This information is currently being used to further refine the test and scoring guide. To date, the feedback received from other institutions has been very positive and helpful. The data collected from these institutions that is available for this report are summarized below.

Evaluation of Skill Areas Targeted by the CAT Instrument

Faculty participants in the scoring workshops were asked to indicate which of the skill areas targeted by the CAT instrument they considered to be important components of critical thinking. Figure 2 illustrates the findings of this survey. The findings indicate that the areas of skill targeted by the CAT instrument were generally perceived as important components of critical thinking by most faculty who participated in the three scoring workshops this year. The only area where less than 80% of the faculty felt the area was an important component of critical thinking involved using mathematical skills to solve a complex real-world problem.

Figure 2
Percent of Faculty that Identify Areas Targeted by CAT as Important Components of Critical Thinking

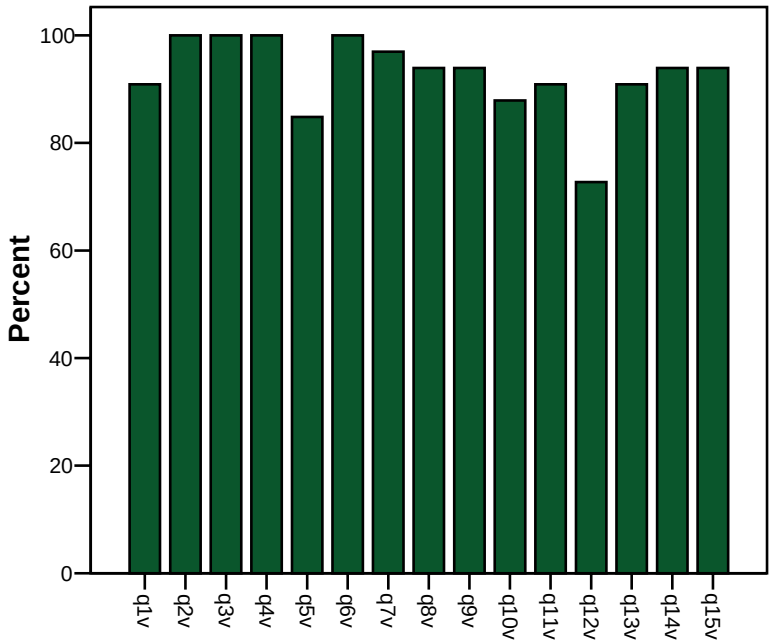


Evaluation of Question Face Validity

The faculty who participated in the scoring workshops were also asked to evaluate the face validity of each question contained in the CAT instrument. Most faculty felt that the questions included on the CAT instrument were valid measures of critical thinking (see figure 3). The question with the lowest overall support (question 12) involved using a mathematical calculation that was needed on subsequent questions to help solve a complex real-world problem. We received some suggestions for improving question #5 that we will explore to improve its perceived validity.

Figure 3

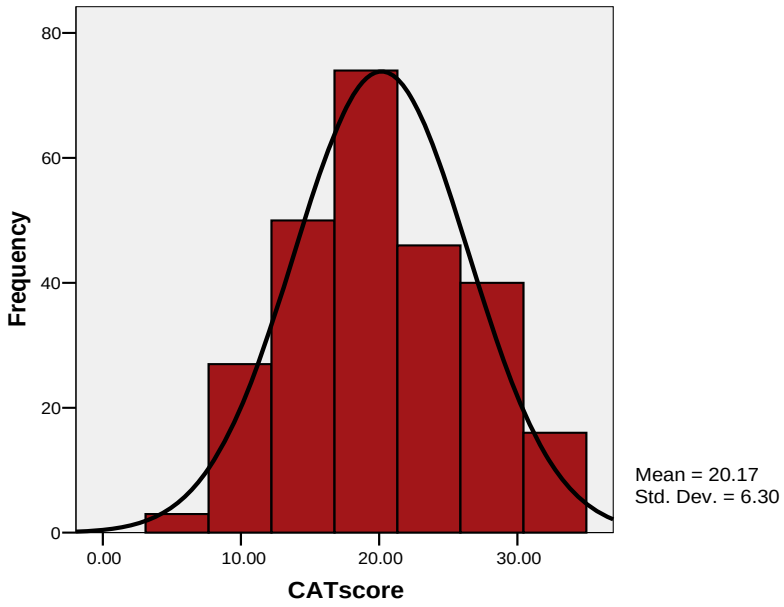
Percent of Faculty Indicating Question Measures a Valid Component of Critical Thinking



Distribution of Scores

Figure 4 shows the distribution of student scores (raw) on the CAT instrument against the normal curve. These scores are similar to those obtained in prior testing at TTU and the University of Memphis. Scores ranged from a low of 7 to a high of 33. There was no evidence of a floor effect or a ceiling effect (lowest possible score = 0, highest possible score = 40). We expect to adjust the weights assigned to each question based on input from the faculty scorers and our external consultant. Once we have finalized question weights, we will explore procedures to standardize the test scores.

Figure 4
Distribution of Student Scores



Correlation with other Measures of Student Performance

Performance on the CAT instrument was correlated with other measures available for the students tested at the participating institutions including entering SAT scores and cumulative grade-point averages. These correlations appear in table 2. The correlations provide support for the criterion validity of the CAT instrument. Entering SAT scores explained 25% of the variability in the CAT instrument. The magnitude of the correlation with the entering SAT score is similar to findings that have been previously observed with the entering ACT score, concurrent performance on the ETS Academic Profile Test, and the California Critical Thinking Skills Test (CCTST).

Table 2
Correlations

	SAT (verbal & math)	Cumulative Grade-point Average
CAT Score	.50 *	.34 *
SAT	-	.52 *

* correlations significant, $p < .01$

Scoring Reliability

Scoring reliability was evaluated by examining scores assigned by faculty grader one and faculty grader two on each question. The average reliability of scoring across questions is presented in table 3.

Table 3
Scoring Reliability

Location	Scoring Reliability
University of Hawaii	.80
University of Southern Maine	.78
University of Texas	.85
Overall	.81

Preliminary Analysis of Cultural Fairness

Although more extensive analyses of any possible ethnic/racial/gender bias in the CAT instrument are planned, a preliminary analysis of available data provided encouraging results. A multiple regression analysis revealed that once the effects of the entering SAT score were taken into account, none of the predictors related to gender, race, or ethnic background were significant predictors of overall CAT performance.

CAT Performance and NSSE Scores at TTU

A stratified random sample of 120 seniors at TTU received both the CAT instrument and the NSSE survey to evaluate the potential relationship between different types of student engagement activities and performance on the CAT instrument. A scoring workshop was also conducted at TTU to evaluate student performance on the test. Although the data are still being analyzed, preliminary findings indicate that various components of the NSSE are significantly correlated with student performance on the CAT instrument. The table below illustrates some of the correlations between specific NSSE questions and CAT scores. In a regression analysis, the combination of NSSE questions listed below yielded a regression coefficient = .426, $p < .01$. These results provide additional support for the validity of the CAT instrument and indicate some potential areas where strategic initiatives might be focused to improve critical thinking performance.

Table 4
NSSE Correlations

NSSE Question	Correlation with CAT Score
(1i) Put together ideas or concepts from different courses when completing assignments or during class discussions.	.165*
(2a) Memorizing facts, ideas, or methods from your courses and readings so you can repeat them in pretty much the same form.	-.245**
(3b) Number of books read on your own (not assigned) for personal enjoyment or academic enrichment.	.209*
(7h) Plan to participate or already participated in culminating senior experience (thesis, capstone course, project, comprehensive exam, etc.)	.224**
(11e) Institution contributed to thinking critically and analytically.	.157*

* Significant at .05 level (one tailed)
** Significant at .01 level (one tailed)

2000-2005 Summary and Conclusions

Five years ago, TTU set out to evaluate Tasks in Critical Thinking (ETS) as an instrument to assess students' critical thinking skills. The ETS test was selected because it would involve faculty in the scoring of open-ended responses to better help our faculty understand our students' weaknesses. In our first year report, we pointed out some of the weaknesses of this test and were subsequently encouraged to explore other testing alternatives. Given our interest in a faculty scored test, we were left with few options. We decided to embark on a rather ambitious project to try to develop our own test of critical thinking, a test that would capture some of the positive aspects of the ETS test and yet avoid the numerous problems we observed. In less than five years, TTU has made remarkable progress in developing a short-answer essay test to evaluate students' critical thinking skills. We have now administered this instrument to over 1000 students at five universities across the country. The instrument has demonstrated excellent face validity, criterion validity, scoring reliability, and it even appeals to students taking the exam. Our work on this instrument has been recognized by SACS and the National Science Foundation. With funding from the National Science Foundation we are now in the process of refining the test using a distinguished pool of universities across the country. This initiative has exceeded our highest expectations for success and is an excellent example of the positive results that can occur from performance funding.

We will continue to work on this project even though there is no longer a performance funding incentive to do so. In fact, we have found in our search for a QEP topic, that the skills we were attempting to measure with the CAT instrument are the very same skills our faculty, students, and employers think are most important. Consequently, our QEP topic for SACS will focus on improving students' critical thinking/real world problem solving skills through active learning strategies. The CAT instrument will provide one useful assessment of our progress on this QEP.

Adaptability and Feasibility for Statewide Testing

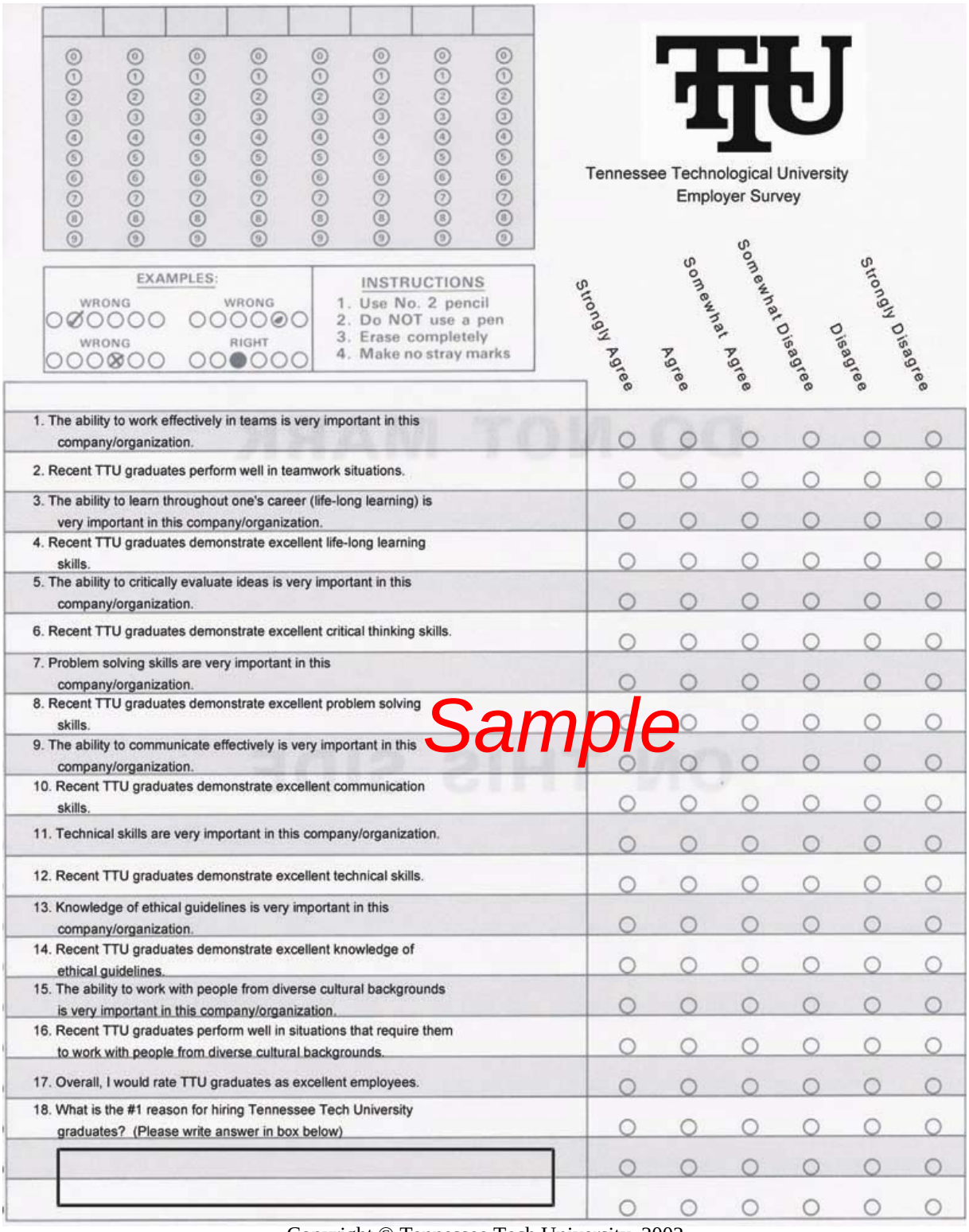
We believe that the CAT instrument could be useful to other institutions in Tennessee. The usefulness of the test relates to two important characteristics.

- It assesses a collection of critical thinking skills that diverse groups of faculty consider important components of critical thinking (and that no other test assesses as completely)
- It serves as a faculty development tool to encourage improvements in pedagogy by involving faculty in the scoring of student responses and making them aware of their students' shortcomings in areas they consider essential for student success.

The recent NSF grant is allowing TTU to further refine the test using a national audience. The enhancements to the instrument that occur as a result of this funding will make it even more useful to other institutions.

Because the test is faculty scored, it will not be financially feasible for most institutions to administer the instrument to all graduating seniors. Although the cost of the test itself is relatively low, the cost associated with paying faculty to score the test makes it prohibitive for testing very large groups of students. A representative sample of 100 to 200 students can be scored by 10 – 14 faculty in a one-day scoring workshop. This size sample can provide an adequate cross section of the institution to break down performance by college and assess efforts to improve critical thinking. The test is best suited for situations in which the institution has a specific goal to improve critical thinking because the involvement of faculty in the scoring will support quality improvement efforts.

Appendix I
Employer Survey



Tennessee Technological University
Employer Survey

EXAMPLES:
WRONG WRONG WRONG RIGHT

INSTRUCTIONS
1. Use No. 2 pencil
2. Do NOT use a pen
3. Erase completely
4. Make no stray marks

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
1. The ability to work effectively in teams is very important in this company/organization.	○	○	○	○	○	○
2. Recent TTU graduates perform well in teamwork situations.	○	○	○	○	○	○
3. The ability to learn throughout one's career (life-long learning) is very important in this company/organization.	○	○	○	○	○	○
4. Recent TTU graduates demonstrate excellent life-long learning skills.	○	○	○	○	○	○
5. The ability to critically evaluate ideas is very important in this company/organization.	○	○	○	○	○	○
6. Recent TTU graduates demonstrate excellent critical thinking skills.	○	○	○	○	○	○
7. Problem solving skills are very important in this company/organization.	○	○	○	○	○	○
8. Recent TTU graduates demonstrate excellent problem solving skills.	○	○	○	○	○	○
9. The ability to communicate effectively is very important in this company/organization.	○	○	○	○	○	○
10. Recent TTU graduates demonstrate excellent communication skills.	○	○	○	○	○	○
11. Technical skills are very important in this company/organization.	○	○	○	○	○	○
12. Recent TTU graduates demonstrate excellent technical skills.	○	○	○	○	○	○
13. Knowledge of ethical guidelines is very important in this company/organization.	○	○	○	○	○	○
14. Recent TTU graduates demonstrate excellent knowledge of ethical guidelines.	○	○	○	○	○	○
15. The ability to work with people from diverse cultural backgrounds is very important in this company/organization.	○	○	○	○	○	○
16. Recent TTU graduates perform well in situations that require them to work with people from diverse cultural backgrounds.	○	○	○	○	○	○
17. Overall, I would rate TTU graduates as excellent employees.	○	○	○	○	○	○
18. What is the #1 reason for hiring Tennessee Tech University graduates? (Please write answer in box below)	○	○	○	○	○	○
	○	○	○	○	○	○
	○	○	○	○	○	○

Sample

Appendix J

Alumni Survey

TENNESSEE TECHNOLOGICAL UNIVERSITY

Office of the President
Box 5007
Cookeville, Tennessee 38505-0001
(931) 372-3241
Fax: (931) 372-6332

March 3, 2005

Dear Alumnus:

Educational quality has become an important issue in Tennessee and in the nation. In an effort to ascertain the quality of your education, the Tennessee Higher Education Commission has suggested that all those who graduated from Tennessee colleges and universities in 2002-2003 be surveyed, so that graduates would have a chance to evaluate their experiences. In the spirit of this effort, Tennessee Technological University would like to ask for your help. We at TTU are attempting to assess past students' reactions to their experiences at the University and to see how well the University has prepared them for employment and their role in a democratic society.

In order for the results to truly represent the thoughts of all TTU alumni, it is important that each questionnaire be completed and returned. Any extra comments can be written on a separate sheet of paper. You may be assured of complete confidentiality. The questionnaire will not be seen by anyone except the researchers. All results will be reported as group responses such as total university responses or responses by major.

The results of this research will be made available to senior University administrators as they continue to promote quality improvements and plan program changes.

Please respond by March 25. Thank you for your assistance.

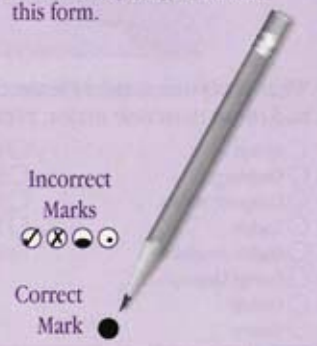
Most cordially,

Robert R. Bell
President

Directions: **In this questionnaire, you are asked to respond with regard to your experience at Tennessee Technological University. Please select only one response from the choices given and fill in the appropriate bubble on the survey form.**

Marking Instructions

- Use a No. 2 pencil only.
- Do not use ink, ballpoint, or felt tip pens.
- Make solid marks that fill the circle completely.
- Erase cleanly any marks you wish to change.
- Make no stray marks on this form.
- Do not fold, tear, or mutilate this form.



Alumni Survey

1. How satisfied are you with the educational experience you had at TTU?

Ⓐ Very Dissatisfied Ⓑ Dissatisfied Ⓒ Satisfied Ⓓ Very Satisfied

2. If you could start college again, would you enroll at TTU?

Ⓐ Definitely Not Ⓑ Probably Not Ⓒ Probably Yes Ⓓ Definitely Yes

How would you rate the following aspects of your TTU experience?

	Poor	Fair	Good	Excellent
3. Your academic experience	○	○	○	○
4. Your social experience	○	○	○	○
5. Your cultural experience	○	○	○	○
6. Your overall experience	○	○	○	○

7. While attending TTU, how often would you say you did each of the following?

Activity	Never	Seldom	Occasionally	Often
Used written reference materials	○	○	○	○
Completed a paper or project that integrated ideas from several sources	○	○	○	○
Applied a concept or technique you learned in class in another setting	○	○	○	○
Used on-line library databases (Infotrack, etc.)	○	○	○	○
Tried to explain a method or theory to another person	○	○	○	○
Used the internet in classroom assignments	○	○	○	○

8. Please indicate if you used any of the following services while at Tennessee Technological University, and rate your overall satisfaction with each. If you **did not use (N/A)** any of the services, please fill in the corresponding bubble and move to the next item.

	USE		SATISFACTION			
Service	N/A	Used	Poor	Fair	Good	Excellent
Library Facilities/Services	①	②	①	②	③	④
Registration Services	①	②	①	②	③	④
Financial Aid Services	①	②	①	②	③	④
Computer Facilities/Services	①	②	①	②	③	④
Advising Services	①	②	①	②	③	④
Practicum/intern/service learning experience	①	②	①	②	③	④

What was your major? Please choose one of the following by filling in the bubble next to each response. If you had more than one major, please indicate your primary major only.

- ○ Biology
- ○ Chemistry
- ○ Computer Science
- ○ English
- ○ English–Journalism
- ○ Foreign Languages
- ○ Geology
- ○ History
- ○ Mathematics
- ○ Physics
- ○ Political Science
- ○ Professional Communication
- ○ Sociology
- ○ Wildlife & Fisheries Sci.
- ○ World Cultures & Business (A&S)
- ○ Accounting
- ○ Business Management
- ○ Economics, Finance, Marketing
- ○ World Cultures & Business (Bus.)
- ○ Child & Family Sci.
- ○ Fine Arts
- ○ Health & Physical Edu.
- ○ Multidisciplinary Studies
- ○ Music
- ○ Psychology
- ○ Secondary Education
- ○ Special Education
- ○ Chemical Engineering
- ○ Civil Engineering
- ○ Computer Engineering
- ○ Electrical Engineering
- ○ Industrial Engineering
- ○ Mechanical Engineering
- ○ Industrial Technology
- ○ Agriculture
- ○ Human Ecology
- ○ Nursing
- ○ Interdisciplinary Studies
- ○ Professional Studies

Page 2

Alumni Survey

9. In answering the questions below, please think of your **overall experience** at **TTU**. Please indicate the degree to which your education at **TTU** added to your abilities in each of the following skills areas.

Skills Area	Very Little	Somewhat	Very Much
Practical skills necessary to obtain employment in your field	○	○	○
Getting along with people of different races or ethnic groups	○	○	○
Ability to grow and learn as a person	○	○	○
Ability to lead or guide others	○	○	○
Self-confidence in expressing your ideas	○	○	○
Appreciation of different cultures	○	○	○
Planning and carrying out projects	○	○	○
Speaking effectively	○	○	○
Writing effectively	○	○	○
Understanding written information	○	○	○
Understanding graphic information	○	○	○
Ability to use information/computer technology	○	○	○
Learning on your own	○	○	○
Defining and solving problems	○	○	○
Working cooperatively in a group	○	○	○
Ability to understand mathematical concepts	○	○	○
Understanding global environmental concerns	○	○	○
Understanding/appreciating the arts	○	○	○
Understanding/applying scientific principles and methods	○	○	○

10. The following questions relate to your major. Thinking about your major, please rate the quality of each item below.

	Poor	Fair	Good	Excellent
Availability of your faculty advisor	○	○	○	○
Quality of information provided by your advisor	○	○	○	○
Clarity of degree requirements in the major	○	○	○	○
Clarity of objectives for courses in the major	○	○	○	○
Opportunities for student evaluation of instruction	○	○	○	○
Availability of faculty to help students outside of class	○	○	○	○
Quality of courses to prepare you for employment	○	○	○	○
Quality of instruction in the major	○	○	○	○
Opportunities to express ideas in writing in the major	○	○	○	○
Usefulness of information learned in class in day-to-day activities	○	○	○	○

11. While at **TTU**, with how many faculty members did you develop a close relationship (such that you feel you could ask them for a letter of recommendation)?

Ⓐ None Ⓑ One Ⓒ Two Ⓓ Three or more

12. If you could choose your major again, would you select the same major?

Ⓐ Definitely No Ⓑ Probably No Ⓒ Probably Yes Ⓓ Definitely Yes

13. Overall, how satisfied were you with the climate of diversity at **TTU**?

Ⓐ Very Dissatisfied Ⓑ Dissatisfied Ⓒ Satisfied Ⓓ Very Satisfied

14. How would you characterize the preparation you received at **TTU** for further study at another college or university?

Ⓐ Poor Ⓑ Fair Ⓒ Good Ⓓ Excellent

Alumni Survey

BACKGROUND INFORMATION: The series of questions below are related to a variety of basic demographic areas that are needed in order to better serve Tennessee Technological University. TTU assures you that all of the material provided is anonymous and will remain confidential.

15. What is your gender?

Ⓐ Female Ⓑ Male

16. How old were you when you first began at TTU?

Ⓐ Under 22 Ⓓ 31 to 45
Ⓑ 22 to 24 Ⓔ 46 to 60
Ⓒ 25 to 30 Ⓕ Over 60

17. What is your present age?

Ⓐ Under 22 Ⓓ 31 to 45
Ⓑ 22 to 24 Ⓔ 46 to 60
Ⓒ 25 to 30 Ⓕ Over 60

18. What is your race/ethnic group?

Ⓐ Asian-American/Pacific Islander Ⓓ Caucasian
Ⓑ Native American/American Indian Ⓔ Hispanic/Latino
Ⓒ African American Ⓕ Other _____

19. For the most part, were you a part-time or full-time student?

Ⓐ Full-time Ⓑ Part-time

20. While attending Tennessee Technological University, about how many hours did you work per week?

Ⓐ Did not work Ⓓ 20 to 29 hours
Ⓑ Employed fewer than 10 hours Ⓔ 30 to 40 hours
Ⓒ 10 to 19 hours Ⓕ More than 40 hours

21. Which of the following best describes your present employment situation?

Ⓐ Working full-time (not self employed) Ⓓ Working part-time (not self employed)
Ⓑ Self employed Ⓔ Unemployed, seeking employment
Ⓒ Unemployed, not seeking employment Ⓕ Full-time student/not employed

22. Are you employed in the field in which you were educated? If not, why? (choose best response)

Ⓐ I am employed in my major field Ⓓ The jobs in my field did not pay well
Ⓑ I could not find a job in my field Ⓔ The jobs in my field did not offer opportunities for advancement
Ⓒ I developed new career interests after leaving college Ⓕ I am a full-time student/not presently employed

23. How did you become aware of the opening that became your first job after graduating from college?

Ⓐ I was already working in the job Ⓔ Newspaper advertisement
Ⓑ Cooperative education project/faculty contact/service learning Ⓕ Contact through friend or relative
Ⓒ College placement office Ⓖ Other
Ⓓ Employment/placement agency

24. What is your current annual salary?

Ⓐ Less than $20,000 Ⓓ $50,000 - $64,999
Ⓑ $20,000 - $34,999 Ⓔ $65,000 or more
Ⓒ $35,000 - $49,999 Ⓕ Not applicable

25. Are you presently enrolled in a college or university?

Ⓐ Yes, part-time undergraduate Ⓓ Yes, full-time graduate/professional student
Ⓑ Yes, full-time undergraduate Ⓔ Not presently enrolled in a college or university
Ⓒ Yes, part-time graduate/professional student

Appendix K

Sample Individual Teaching/Learning Enhancement Proposals

Unit: HISTORY ***Username:*** KOsburn ***Amount Requested:*** $2,900.00

First Name: Katherine ***Last Name:*** Osburn

QEP Relationship 3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Goal

To design an interdisciplinary program in Sustainability Studies for Tech that will engage our students in addressing environmental problems through real-world problem solving. The larger goal is to make Tech a leader in environmental education and to create a sustainable campus that can be an example for cutting edge solutions to our environmental dilemmas.

Action Plan

1. To study what programs are already in place at universities around the world and to assess universities that have instituted ideas that promote sustainability on campus.
2. To design an environmental history course that evaluates various obstacles to sustainability and seeks to compile solutions from different cultures across time.
3. Students will work in groups to identify environmental problems in their historical contexts and to seek what we can learn from the past.
4. They will develop an action plan to educate the TTU community as to the problems we are facing, the historical and cultural reasons for these problems, and ideas about how to solve them.
5. They will offer proposals for "greening" Tech's campus by researching campuses that have improved their ecological footprint.

I plan on using the money to travel with students to campuses on the cutting edge of sustainability solutions, to bring in speakers to help our students and faculty design this program, and to pay for teaching assistants to assist in the classroom.

Participants

In addition to myself, I plan on involving approximately 10 colleagues across the various disciplines who have indicated an interest in these issues. I will draw on the people who helped me in the cross disciplinary Sustainability Seminar that I did for Honors last spring. I believe that this class would work best if enrollment is restricted to students who have exhibited an interest in this project and a commitment to environmental education. Therefore, I will contact each faculty member that teaches in this field and have them recommend students for this course, whom I will then recruit. This way, every interested department will have a direct stake in this project. I project an enrollment of 12-15 students in the course; this class should be capped at 15 so that students can get individual attention that enhances their hands-on learning experience.

Assessment

To discover whether I have met my goals, I will use student feedback from IDEA evaluations to assess improvements in critical thinking, teamwork, and communication skills. I will then compare the results from this survey to the University norms and the norms from my other classes

Unit: Sociology and Philosophy ***Username:*** PCampion ***Amount Requested:*** $2,500.00

First Name: Patricia ***Last Name:*** Campion

QEP Relationship 3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Goal

Students in the Field Research Methods class are expected to be able to conduct social research projects in real life situations. The goal of this project is to give them experience with conducting an applied research project, from design to presentation. It will be completed for a local social service organization, to address a need that the organization has identified, such as a needs assessment or a program evaluation. Not only will the students put in practice what they learn in class, but they will also develop their capacity to work in teams, interact with social service organizations that they probably will encounter in their professional life as sociologists, and contribute to the welfare of a local community.

Action Plan

Social service organizations in the local area will be contacted in advance to discuss areas where they could use a social research project. At the beginning of the semester, students will be presented with a choice of 2 or 3 possible projects, from which they will collectively choose their class project. The class will then be divided in teams. Each team will use a different field method to contribute to the realization of the project (in-depth interviews, participant observation, focus groups, content analysis). At the beginning of the process, the class will meet with the organization to clarify the goals of the project and start planning its development. Throughout the semester, the team will report progress to each other, use course information to refine their methodology, and solve the problems that they encounter in the field. The organization will be updated regularly on the progress made. At the end of the semester, the students will write a report and present their results to the organization. Funds are requested to cover audio and video digital recording and transcribing equipment for students who will conduct interviews and focus groups, as well as instructor time for the preparation of the project.

Participants

The main participants will consist of Dr. Patricia Campion and up to 20 students enrolled in this course. Staff members from the selected organization will also be involved as needed.

Assessment

In addition to scores on class requirements (paper, oral presentation, team and class participation), students' progress will be assessed with the IDEA evaluation system and a survey. This survey will include a few questions from the National Survey of Student Engagement and other questions focusing on the stated goals of enhancing critical thinking, real-world problem solving, service learning, and service to the community.

Unit: BIOLOGY ***Username:*** MRedding ***Amount Requested:*** $3,000.00

First Name: J. Michael ***Last Name:*** Redding

QEP Relationship 1 - Improve critical thinking/real-world problem solving.

Goal

To provide an opportunity for upper-class science students to mentor elementary and secondary students in the development, conduct, and presentation of age-appropriate science projects. Effectively, mentors will be engaged in a service learning project, i.e., by providing general and technical services to younger students, TTU students will be improving their own skills and potential for creative and socially relevant work. By mentoring younger students, the TTU students are expected to exercise their creative thinking ability (QEP Focus 4) to conceive and implement a project that addresses a real-world problem (QEP Focus 1) using acceptable scientific methodology. The mentor and the student will form a natural working team (QEP Focus 3). Moreover, TTU faculty will participate as team members to supervise and, when feasible, facilitate projects. When possible, school science teachers and parents may be enlisted to serve as team members. During the project, especially at the terminal presentation phase, the mentor will practice communication skills (QEP Focus 2) by coaching his/her student to do the same. This project will be complementary to ongoing initiatives at TTU, regionally and nationally, including the TTU STEM Center Program, the P-16 Educational Integration Program, and the Appalachian Educational Laboratory Program.

Action Plan

1. Identify and recruit 10-20 competent upper-class science and engineering students at TTU who are willing to serve as mentors.
2. With the assistance of local public school science teachers and education faculty from TTU, pair volunteer mentors with students.
3. Provide supervision, material support, and a monetary stipend to the mentors for the purpose of conducting a science project with their student(s).
4. Organize a "demonstration event" at TTU where the mentors and students would present their projects to a group of science faculty with the intention of providing immediate feedback to the students and mentors on all aspects of the projects. Faculty from each of the science departments and the College of Engineering would be invited to participate.
5. Encourage the students' participation in local and regional science fair competitions.

Participants

PI: Dr. J. M. Redding, Professor of Biology, has been a mentor and judge for local, regional, and national science fair competitions for almost 15 years.

TTU Faculty: To be identified. Will include representatives from science, engineering, and education departments.

TTU Student Mentors: To be identified. Will include representatives from science and engineering departments.

Assessment

Mentors will be required to submit a written report of their experience including a complete log of activity and account of funds expended to conduct the project. In particular, mentors will be asked to self-evaluate improvement in their critical thinking, communication, and/or team building skills. Specific questions will adapted from the National Survey of Student Engagement.

Questionnaires will be provided to the school-age students and/or their parents to request feedback about their mentor's contributions to the project and impact of the project on the student's attitude or abilities in science and critical thinking activities.

Unit: Economics, Fin. & Mark. ***Username:*** JJonakin ***Amount Requested:*** $1,000.00

First Name: Jon ***Last Name:*** Jonakin

QEP Relationship 3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Goal

Students enrolled in the class Natural Resources and Environmental Economics [AGBE 4120] gain appreciation of resource and environmental issues when these issues are seen and understood to exist in their immediate vicinity. The goal of this proposal is to identify, track the history of, and propose solutions for current local or regional resource and environmental problems. Students will work in small teams to investigate the issue or problem they have identified. Among the many potential topics of investigation would be such problems as water pollution related to storm water runoff, the costs and benefits related to the mining practice known as mountain top removal, the costs and benefits of policies designed to protect wetlands from farming and development, the costs and benefits of energy conservation measures taken at TTU. A final term paper will be prepared by each team that utilizes environmental economic theory and methodology.

Action Plan

Once a local resource/environmental issue is chosen by a team for investigation, the students will begin to research the history of the issue. Central to their research will be the need to identity and to meet with the local 'key informants'--citizens and government officials, whether municipal, county, or state--that are involved with and affected by the issue. The faculty member will work with students in identifying the problem and designing the research plan. The term paper will be offered to those key informants who were interviewed or otherwise assisted the students in their research.

Funds are requested to cover costs related to travel and the photocopying of relevant materials.

Participants

The primary participants will include Dr. Jon Jonakin and the 15 to 25 students expected to enroll in the course.

Assessment

The progress made by students on learning to identify and solve problems and to think critically and work together in teams will be evaluated by the IDEA survey administered each semester.

Unit: Electrical & Comp. Eng. ***Username:*** MAbdelrahman ***Amount Requested:*** $1,750.00

First Name: Mohamed ***Last Name:*** Abdelrahman

QEP Relationship 1 - Improve critical thinking/real-world problem solving.

Goal

Most of the faculty and successful practicing engineers engage in critical thinking without a conscious realization of the process. The goal of this plan is to help faculty understand the definition of critical thinking and generate problems in their area of expertise that can be presented to students within their normal class work to make sure that students can effectively engage in critical thinking and solve real-world problems.

Action Plan

Organize a one day workshop to be led by an expert on critical thinking to help faculty understand the definition of the term “critical thinking”.

Each of the faculty will focus as part of the workshop on generating one problem for a sophomore, a junior and a senior class that he is familiar with.

The generated set of problems will be presented to the faculty in charge of teaching those classes. Faculty will be asked to present students in these classes with said problems as part of course work.

Participants

Faculty will participate in a local workshop to be directed by a local expert on critical thinking. Expert and organizer will be paid $250 for a one day workshop. Each of the participating faculty (up to 10) will be paid $100 for attending and generating the problems to be used in classes. Students will participate by solving the problems generated as a result of the workshop.

Assessment

Performance of students in solving problems generated from the workshop with special focus on critical thinking will be used as an assessment tool.

Unit: Manuf. & Industrial Tech. ***Username:*** IFidan ***Amount Requested:*** $3,000.00

First Name: Ismail ***Last Name:*** Fidan

QEP Relationship 3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Goal

Hands-on Design and Visualization Enhanced Engineering Education

The objective of this project is to enhance the student learning process by implementing a hands-on undergraduate engineering curricula transformation that integrates visualization modules, design and simulation software, and virtual experiments in core industrial technology design and manufacturing courses. One faculty from the College of Engineering and one faculty from the Institute for Technological Scholarship will participate in the proposed transformation. The intellectual merit of the project includes the pedagogical improvements that can be made in engineering education as a result of thorough integration of interactive simulation, rapid prototyping, CNC, and visualization throughout the industrial design and manufacturing curriculum. The focus will be on interactivity both inside and outside of classes so that students obtain hands-on experience in classroom and industry domains. Another desired goal is to allow students to achieve a deeper understanding of basic principles in a team environment, especially for phenomena difficult or impractical to illustrate in physical laboratories. Integration of advanced educational tools such as WebCT, interactive design, rapid prototyping, CNC, visualization and simulation modules in the curricula will enhance student learning, improve quality of engineering education, and prepare graduates who possess engineering know-how to practice in a world transformed by computer and Internet technologies. Modules developed during the project period will become building blocks for complete web-based undergraduate engineering degree or certificate programs that (if) the College of Engineering plans to launch in the near future. Once implemented, these programs will reach a diverse and non-traditional student population that would not have otherwise enrolled due to geographical or other limitations. The courses affected by this proposal are CAD for Technology, CNC Machining Practices, Tool Design, Rapid Prototyping, Advanced CAD Techniques, and Advanced CNC Concepts.

Action Plan

Local industry and manufacturing companies that have industrial design and manufacturing projects will be identified by the design and manufacturing faculty before the semester begins. These companies will be asked to provide general descriptions of their potential design and manufacturing problems. Students enrolled in the courses will be assigned to teams, and each team will select an industrial problem. All the student teams will continuously work on their industrial projects while they attend the hybrid WebCT-based design and manufacturing courses and learn cutting edge concepts in design and manufacturing. Team members and faculty will meet frequently and resolve their project-related issues. Team time will be scheduled in courses and team reporting will review the other teams' progress at key points throughout the semester to encourage critical thinking about the developed issues. The faculty member will also provide feedback to each team. At the end of the semester, project teams and their members will make an official presentation of their project to students, an invited audience of participating companies, and the TTU community.

WebCT modules needed to accomplish the Web-based delivery will be prepared by the faculty. Both faculty in this project are expert WebCT users and instructors in the Institute for Technological Scholarship.

Funds ($3000) are requested to cover course and project consumables (3/10), team travel (1/10), the faculty release time or budget to develop the Web-based modules.

Participants

The primary participants will include Dr. Ismail Fidan and Dr. Robert Clougherty. Almost 100 students enrolled in core design and manufacturing courses will also participate in the project. The final presentation will be open to all TTU faculty and students as well as participating companies.

Assessment

Students' progress on learning to solve problems, think critically and work as teams will be evaluated using the IDEA evaluation system. Extra questions will also be generated on the core learning outcomes.

Students will be asked to complete a short survey that includes questions modeled on several items from the National Survey of Student Engagement that relate to critical thinking, real-world problem solving, service learning, importance of teamwork, visualization enhanced learning, and service to the community.

During the team-time presentations, each person enrolled in the class will evaluate the presenters in terms of the project goals, accomplishments, team playing, and critical thinking. Anonymous results will be typed and shared with the teams. Team presentations will also be evaluated by the audience and by industrial representatives. Their evaluation scores will be used for the continuous improvement of the courses.

Unit: Foreign Languages ***Username:*** MGroundland ***Amount Requested:*** $3,000.00

First Name: Mark ***Last Name:*** Groundland

QEP Relationship 2 - Improve critical thinking/real-world problem solving with emphasis on communication skills.

Goal Spanish for Health Services

This proposal will provide the initial funds for a much needed new course, Spanish for Health Services. At present the health system is in dire need of professionals who are able to communicate effectively with their Hispanic patients who do not speak English. Students will learn Spanish that is specifically tailored for the health field. Not only will they be able to interact with their future Hispanic patients by asking them questions and gathering information needed in Spanish, but students will also gain an appreciation for Hispanic culture, knowledge about which is essential for a more complete understanding of their patients as individuals as well as an understanding of how certain cultural nuances appear within the healthcare setting.

Relationship to Potential University QEP Focus (addendum)

This course is being created to address a critical problem facing the Hispanic population in our community. It will prepare our students to play a valuable role in the challenge to give healthcare to this commonly underserved group in our society. Students will draw upon their Spanish-speaking ability as well as their knowledge of Hispanic cultures in order to cross both language and cultural barriers to communicate with their Hispanic patients. Our future healthcare professionals will learn about the cultural complexities of the Hispanic people and be able to determine their cultural background (whether they are indigenous and therefore speak another language, for example) in order to find the best means to cross a wide array of cultural barriers. Thus, students will learn to engage in critical thinking in order to communicate effectively with their Hispanic patients.

Action Plan The course is currently being developed in consultation with faculty from the School of Nursing. The focus must be on active learning which is best achieved with teamwork in the classroom. Role-playing, interviews, laboratory work, and field trips to healthcare settings (hospitals, health clinics) are just some of the components of this course. Students will also develop basic instructional videos for Hispanic patients as well as situational scenarios for healthcare professionals and future students from which to learn. A preliminary symposium on Latino Culture and Healthcare in Tennessee will occur in fall 2006 to discuss cultural issues concerning Hispanic patients. Guest speakers will be invited to address the Tennessee Tech community and also health professionals from around Tennessee. This course and events such as the aforementioned workshop will not only markedly improve our students' ability to care for their future Hispanic patients, but also serve the community at large.

The funds will be used to purchase language laboratory technology, pertinent library resources, and equipment for videotaping students. The money will also be used to help fund the aforementioned symposium. All these components are needed to improve students' critical thinking skills in Spanish for health purposes.

The language laboratory exercises will enable students to hear native speakers in Spanish discussing and reviewing the pertinent topics in each chapter. The library resources are essential for students to research cultural topics for presentations in class as well as provide additional sources for medical Spanish vocabulary.

Participants

The primary participants will include Dr. Mark Groundland and 20-28 students from the School of Nursing or those students working toward a future in the healthcare profession.
Gail Stearman from the School of Nursing will be the healthcare advisor as well as contact to different healthcare institutions.

Assessment

This course will be assessed at the student, faculty, and community levels with constantly evolving evaluation devices. A course-specific evaluation form will be used to receive student feedback at midterm. The long form of the IDEA evaluation system will be used at the end of the course, and I will especially select the critical thinking section to compare it to the University average. A specially tailored evaluation form will be used to receive feedback from involved faculty from the School of Nursing as well as the contact healthcare professionals. Finally, evaluation forms will be distributed at our healthcare symposia and all future workshops.

Unit: NURSING ***Username:*** BHRussell ***Amount Requested:*** $3,000.00

First Name: Bedelia ***Last Name:*** Russell

QEP Relationship 1 - Improve critical thinking/real-world problem solving.

Goal

Students in the baccalaureate nursing program are expected to graduate and pass a licensure exam that evaluates their critical thinking abilities and clinical reasoning capabilities. In addition, newly licensed nurses are in the unique position of having to function independently in increasingly complex health care settings within three months of graduation. The goal of this proposal is to incorporate the Legacy Cycle (Geist, 2004; National Research Council, 2000; Schwartz, Lin, Brophy, & Bransford, 1999) as a method of strengthening upper-division nurses' clinical reasoning/critical thinking abilities. The students will begin this Legacy Cycle the first semester of their junior year in upper-division nursing and complete it in their final semester of their senior year.

How information is structured and sequenced for students affects student comprehension and the use of this knowledge in novel situations (Brophy, 2003). The Legacy Cycle benefits students in that it positions them to understand material when it is presented through creation of a "time for telling." The use of a challenge question prompts learners to need to know something and to form questions they want answered, increasing comprehension of information when it is presented in class (Brophy, 2003).

Action Plan

This plan is initiated by a School of Nursing faculty group (Susan Clark, Melissa Geist, Barbara Jared, and Bedelia Russell) and does in no way relate to the overall School of Nursing departmental QEP plan previously submitted.

Faculty will present students with an initial challenge question upon entry into upper division nursing. This will begin the Legacy Cycle. The Legacy Cycle design makes use of a contextually based "challenge" followed by a sequence of instruction where the students offer initial predictions ("Generate Ideas"), gather information from multiple sources ("Multiple Perspectives"), integrate the knowledge gathered and extend this knowledge ("Research and Revise"), and finally formalize their solutions in formative and summative assessment activities ("Test your Mettle" and "Go Public"). The Legacy Cycle design has been implemented with success in the college bioengineering classroom (Brophy, 2003) and has shown promising results in high school classrooms as well (Geist & Klein, 2005, in press).

Faculty will develop challenge questions and their variations based on real-life patient scenarios. Students will be assigned to groups in which they will work together to answer these challenge questions. Once the initial question is answered correctly, then subsequent questions are posed. As the students progress through the curriculum, the Legacy Cycle continues with the addition of more complex challenges building on prior knowledge gained through the first cycle. As students attempt to answer the challenge questions and throughout completion of the Legacy Cycle, they will be given opportunities to discuss their findings and fine-tune their critical thinking process with expert clinicians. The Legacy Cycle culminates in the final semester of their senior year when they "go public" with their case and series of challenge questions through a presentation to a panel of experts, peers, faculty, and entering first-semester junior students.

Funds are requested to cover the following: development of a pre/post clinical reasoning test specific for nursing, i.e., printing and cost of materials; monetary reimbursement of clinical experts; final senior year presentation event-refreshments, hospitality, and additional expenses; travel for dissemination of data; software development to support Legacy Cycle; $750.00 per credit hour for a 3-semester hour.

Participants

Faculty Participation: All faculty teaching in upper-division nursing

Student Participation: All students entering into upper-division nursing

Assessment

National Survey of Student Engagement

Comparison of pre/post clinical reasoning test

Unit: Mechanical Engineering ***Username:*** MPanchagnula ***Amount Requested:*** $3,000.00

First Name: Mahesh ***Last Name:*** Panchagnula

QEP Relationship 4 - Improve critical thinking/real-world problem solving with emphasis on creative thinking.

Goal

Recent employer surveys have indicated that one of the areas where our students are currently lacking relates to dealing with loosely constrained design situations. The goal of this project is to help develop creative and critical thinking skills as they relate to real-world problems, specifically in the realm of transport phenomena.

Action Plan

We will develop an array of transport phenomena design problems that will require resolution of a loosely constrained system through creative and critical analysis and thought. The procedure followed will, in principle, be very similar to an industrial design situation. The PI will draw upon his aerospace industrial experience to help identify suitable problems. The students in this lab-based project will be encouraged to work in teams and develop creative solutions while adhering to common design practices, which will ensure that the proposed solution is grounded in reality.

The funds requested will be used for three purposes. First, a part-time senior/graduate student will help develop the basic framework for the "creative thinking lab". Second, the funds will be used for materials to construct selected student designs. Third, students with exceptionally creative designs will be encouraged to develop upon their work and present their designs at appropriate conferences. A part of the money requested could thus be utilized for student travel.

Participants

Mahesh Panchagnula and one part-time senior/graduate student will be involved in developing the basic framework. The students registered for the Transport Phenomena lab will be participants in the project.

Assessment

The goals proposed in this project can be assessed through two methods. In the short term, student surveys will be utilized to "tweak" the process. In the long term, targeted employer surveys for the students that have been through this program could be utilized to assess the overall progress.

Unit: Chemistry ***Username:*** DSwart ***Amount Requested:*** $2,500.00

First Name: Dan ***Last Name:*** Swartling

QEP Relationship 3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Goal Peer-Led Team Learning in Organic Chemistry:

The goal is to take a guided inquiry approach to teaching organic chemistry. This would allow students to learn to think like a scientist instead of just memorizing the discoveries of great scientists now long dead and decomposed. This approach also involves creative thinking and effective group communication.

Action Plan Take a class of 48 students and divide them into peer-led groups of four. Assign problem sets designed to be worked on as a group, allowing the students to freely discuss solutions and the problem-solving process with each other. Since most people learn best by doing, exercises involving tactile skills will also be emphasized, especially by modeling compounds using traditional molecular model kits or through the use of modeling balloons. The instructor acts as a facilitator and moderator rather than the sole authority figure. To promote teamwork involving the entire class, each student will be assigned two nucleotides to be built from modeling balloons. The models will be brought to the UC, where the entire class will take part in assembling a large DNA helix balloon sculpture to promote National Chemistry Week.

Materials needed:
24 molecular model kits @ $70.00 ea. (2 kits per team)
48 balloon pumps @ $3.00 ea.
48 sets of modeling balloons @ $14.00 ea.

Participants Dr. Dan Swartling and 48 student participants.

Assessment Assessment of outcomes can be achieved through the use of a modified IDEA form and by comparing students' performance on the standardized ACS Organic Chemistry exam to the national norms. Further assessment of outcomes will be achieved by allowing a panel of the instructor's peers to compare this group of students to another section of students taught in a more traditional manner.

Unit: Business ***Username:*** TTimmerman ***Amount Requested:*** $3,000.00

First Name: Timmerman ***Last Name:*** Thomas

QEP Relationship 3 - Improve critical thinking/real-world problem solving with emphasis on team work Skills.

Goal

In Fall 2006, the College of Business Administration will offer UBUS 1010 Success Skills for Business Studies. This is a new course aimed at increasing student success by 1) connecting freshmen with each other and the University and 2) developing critical thinking skills. The goal of this QEP proposal is to specifically incorporate exercises designed to develop critical thinking through interacting teams participating in a business simulation. Support for this proposal will allow the use of a professionally developed business simulation that was designed to expose students to a wide variety of business functional areas (e.g., management, marketing, accounting, economics, entrepreneurship, data analysis).

Action Plan

Student teams will adopt the role of a top management team in the "Virtual Business – Management 2.0" simulation. Student teams will be responsible for the overall success of a virtual business that is competing with other businesses run by other student teams. The simulation provides an abundant data that can be analyzed by students to determine which decisions influence their success. Critical thinking is addressed by having students 1) experiment with different strategic decisions and 2) analyze their decisions and outcomes to determine the cause/effect relationships at work in the simulation. Critical thinking is also supported through the immediate feedback provided to students. By working in teams, students will also learn the advantages and disadvantages of teamwork. The exposure to critical thinking and teamwork should help students be more successful in their collegiate careers and beyond. Funds are requested to cover the cost of a site license for the simulation software and awards for high-performing teams.

Participants

The participants will include Dr. Thomas Timmerman, course assistants, and all students enrolled in UBUS 1020 (approximately 200).

Assessment

Students' progress will be evaluated by the lead faculty member through regular assignments. In addition, progress in critical thinking will be measured via the IDEA evaluation system. Finally, students will complete a critical thinking measure at the beginning of the course and at the end of the course to measure changes over the semester. The long-term success of the course will be assessed by tracking the retention of students and comparing that rate to current rates.

Unit: Counseling & Psychology ***Username:*** ZWilcox ***Amount Requested:*** $2,500.00

First Name: Zachary ***Last Name:*** Wilcox

QEP Relationship 3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Goal

The goal of this proposal is to give students experiences working on a real-world problem as a member of a team. Teams will implement interventions for increasing physical activity levels of specified groups of people in the Cookeville community (including TTU students). The project will be a component of Psychology 4140/5140 (Health Psychology). Health promotion is one of the primary job activities of health psychologists.

Action Plan

Students will be assigned to 5 teams of approximately 5-6 members each. Each team will explore and develop appropriate intervention strategies for a specified population of individuals. Teams will be encourage to develop interventions that are based on current models of health and exercise behavior including mood regulation models, operant conditioning, goal setting, Health Belief Model, Stages of Change Model, Theory of Planned Behavior, and peer consultation and support. The use of innovative integrations of a minimum of 3 intervention strategies/models will be required. Each team will be required to prepare a grant proposal with a $500 itemized budget. The instructor will determine whether the full $500 is allocated. Teams will be required to re-submit grant proposals until the $500 is awarded. The grant writing component of the project is considered valuable as a real-world simulation. Teams will then contact their specified groups, recruit them, and begin implementation of their designed interventions.

Participants

The participants will include approximately 25 -28 students enrolled in Psychology 4140/5140 (Health Psychology) in Spring, 2007. The instructor for the course is Dr. Zachary Wilcox.

Assessment

The instructor will assess the progress (via grades) of each team and 4 key points during the project: after completion of the grant proposal, after 1 week of the intervention, after 6 weeks of the intervention, and at the completion of the intervention. In addition, each team will make a (graded) presentation of its work to the class.

Students' progress on critical thinking and work on teams will be evaluated using IDEA evaluations. In addition, items from the National Survey of Student Engagement that relate to critical thinking, real-world problem solving, and service to the community will be used to assess students' progress in these areas.

Funds are requested to cover transportation, incentives for participation (e.g., refreshments at participant meetings) pedometers (for measuring physical activity), fitness testing, copies (including brochures), and media advertisements. (It is also possible that teams will request funds to cover activities not specified above, but they must be deemed appropriate by the instructor).

Unit: Political Science ***Username:*** LMMaxwell ***Amount*** $2,500.00

First Name: Lori ***Last Name:*** Maxwell

QEP Relationship 2 - Improve critical thinking/real-world problem solving with emphasis on communication skills

Goal

Political Science Honors students from Pi Sigma Alpha will work together in teams to practically apply critical thinking and real world problem solving skills by mentoring students in my American Government and Politics class as well as elementary and high school students to debate current political issues. This will thus facilitate the critical thinking abilities of the American Government and Politics students and the public school students. In addition, it will serve as a P16 initiative and a recruitment tool for the university.

Action Plan

I will select and train four teaching assistants (two each semester for an academic year) who will receive both academic credit and a small stipend for their participation. These students will then establish, train, and coordinate debate teams in the American Government and Politics classes and in the public schools. We will partner with Algood School (a K-8 school) and a local high school. These assistants will select additional top students from the American Government and Politics class to help mentor the public school children. At the public schools debate teams will be established and trained. The assistants and the top students from the American Government class will then stage a debate competition for the public schools where prizes will be awarded.

Funds will be used for a nominal stipend for the four teaching assistants and for putting together the debate competition and for awards.

Participants

One faculty member in political science will participate along with 4 student teaching assistants, the political science honors society, and approximately 80 students in American Government and Politics along with an undetermined number from the public schools.

Assessment

I will assess students' critical thinking skills improvement by comparing previous years IDEA evaluation on progress related to critical thinking, teamwork, and communication.

I will also develop a short survey based upon the NSSE to evaluate students' progress.

Appendix L

Sample Unit Plans

Counseling Center
College: Student Affairs

***COUN* Goal Number: 1**

The goal of this proposal is to provide students with opportunities to improve their communication skills as a means to foster positive and successful interpersonal relationships. Development of real-world problem solving skills in the area of interpersonal relationships is an important element in university and life-long success. Whether at school, work, home, or in other settings, interpersonal relationship skills affect a person's success throughout life. Additionally and according to preliminary analysis of National Survey of Student Engagement (NSSE) variables, the quality of interpersonal relationships is correlated with retention at the university.

Relationship to Potential University QEP Focus:
2 - Improve critical thinking/real-world problem solving with emphasis on communication skills

Action Plan:
Through the use of activities developed to foster interpersonal communication skills, students will have the opportunity to experience the power of communication as it relates to critical thinking and problem resolution in a variety of settings. Obtain funds for a graduate assistant with background in counseling or a related field to aid in the development and presentation of a series of workshops that will incorporate activities simulating real world situations. The activities will provide students the opportunity to use constructive, positive communication skills and strategies to resolve real world problems and improve interpersonal interactions. The workshops will be offered in a four or five session series several times throughout the year. The workshops will be developed in such a manner that any single session can be used in a classroom or other setting to address particular aspects of interpersonal communication. In this way, Center staff can offer all or part of the series to freshman orientation classes (1020) or to other campus classes or organizations.

Method of Assessment:
Student progress will be evaluated using the "Quality of Relationships" measures on the National Survey of Student Engagement (NSSE). Students will also be asked to complete a survey that will be developed to measure their perception of improvement in communication skills and management of real-world interpersonal interactions.

Dollar Amount Requested: $3,000.00

Nursing
College/Division: Academic Affairs

NURS **Goal Number: 1**

Students in the School of Nursing will improve self-regulation skills as part of the process of developing critical thinking skills, through maintenance of a professional portfolio which will be used to record characteristics of patient care assignments, paper topics, and progress and completion of competency tests.

Relationship to Potential University QEP Focus
1 - Improve critical thinking/real-world problem solving.

Action Plan
1. An appropriate commercially available software program for professional portfolio will be selected by the faculty (guided by Kim Hanna, Assistant Professor/ Nursing 2300) of the School of Nursing. This will require purchase of hours from a computer programmer to adapt existing electronic portfolios for nursing. The hours will be used to write a clinical passport, patient profile manager, and assignments manager, and create linkage to self administered tests for HIPPA, OSHA, and sexual harassment requirements. One hundred hours is allotted for the development at $30/hour. Work with Doug Talbert in the Computer Science Department is planned. 2. The directions for maintenance of the information for individual students will be introduced in Nursing 2300, the first nursing course. 3. Students will input characteristics of patient assignments according to directions that will be developed by faculty. These characteristics will provide the students with the data to allow them to analyze their overall educational experience and provide the basis for communicating to faculty the need for certain characteristics in additional patient assignments. 4. Competency tests (currently through ATI) are administered throughout the program. The portfolio will provide a place for the student to record his or her on-going progress on achieving competency in nursing content. The achievement or lack thereof will be utilized by the student to formulate personal and individual objectives for achieving competency. This plan follows that which is suggested in the Electronic Portfolio Development Project budget: Include release time from a collective of hours from sections of Nursing 2300 to equal 3 semester hours for Kim Hanna for implementation of project.

Method of Assessment
1. Analysis of group data on patient characteristics will be utilized as part of the evaluation of the program of study and clinical assignments. 2. Competency tests scores will be analyzed for individuals and group cohorts 3. NCLEX-RN scores will improve.

Dollar Amount Requested $3,000.00

Arts and Sciences Ph.D. Program
College/Division: College of Arts & Sciences

ENV **Goal Number: 1**

Doctoral students in Environmental Sciences need to learn to critically evaluate real-world environmental issues that may fall outside the bounds of chemistry and biology. The goal is to provide them with opportunities to address a variety of environmental topics and interact with individuals actively involved in the environmental community. A student-run environmental sciences colloquium will be held monthly so that all environmental science graduate students are required to address current environmental topics and listen to outside speakers who will address a variety of environmental issues.

Relationship to Potential University QEP Focus
1 - Improve critical thinking/real-world problem solving.

Action Plan
The Environmental Sciences Executive Committee, environmental sciences faculty in chemistry and biology, and core curriculum faculty in agriculture, earth sciences, and sociology and political science will work together to establish a student-run colloquium. This colloquium will meet monthly and will require that all students participate through presentations and attendance. When possible, outside speakers will be invited to present at a session at least once per semester. Funds are requested to cover travel expenses incurred by guest speakers. Additional funds are requested for refreshments and hospitality following guest speaker presentations.

Method of Assessment
All students will participate as part of their required seminar course (EVS 7910). Environmental sciences faculty will track colloquium attendance and participation. Upon completion of the required dissertation seminar, a grade will be awarded. Presentation of the dissertation seminar will assess the abilities of each student to critically evaluate real-world environmental problems. Students will also be asked to complete a survey at the end of each year's colloquium that will include questions relating to critical thinking and real-world problem solving modeled after various portions of the National Survey of Student Engagement (NSSE – available on TTU's website). Faculty and Student Participation: The primary faculty participants will be Dr. S. Bradford Cook, Director of the Environmental Sciences Ph.D. Program, and Drs. Jeff Boles and Daniel Combs, Chairs of the Chemistry and Biology Departments, respectively. Faculty from each student's graduate committee will evaluate dissertation seminars, which are open to all TTU faculty and students.

Dollar Amount Requested $1,200.00

Biology
College/Division: College of Arts & Sciences

BIOL **Goal Number: 2**

Departmental faculty will enhance their knowledge of active-learning teaching approaches by participating in on- or off-campus training and development workshops devoted to such approaches. All departmental faculty will receive such pedagogical training during their first 3 years of employment.

Relationship to Potential University QEP Focus
1 - Improve critical thinking/real-world problem solving.

Action Plan
The Department of Chemical Engineering (DCE) recently held an active-learning workshop for that department. The workshop was led by one of the faculty who is well versed in active learning instructional techniques. The Department of Biology could join forces with DCE by holding a joint workshop in the future. Alternatively, the department could design and offer its own active-learning workshop. The departmental chair will periodically notify faculty of off-campus opportunities, and funds will be available to offset the costs associated with such faculty development.

Method of Assessment
The departmental chair will track the number of faculty participating in active-learning training by gleaning such information from annual faculty effort reports.

Dollar Amount Requested $1,500.00

Chemistry
College/Division: College of Arts & Sciences

CHEM **Goal Number: 1**

Students in general chemistry for majors will demonstrate improved critical thinking skills through the incorporation of new guided inquiry laboratory experiments to be introduced. Students will be required to work in teams to discover chemical principles.

Relationship to Potential University QEP Focus
3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Action Plan
The Department of Chemistry will replace one traditional experiment in the CHEM1110 and CHEM1120 lab manuals each semester by a guided-inquiry experiment. We will ultimately replace one third of the 22 experiments. Dr. Scott Northrup and Dr. Thomas Furtsch are coordinating this implementation. To administer the Critical Thinking Assessment test, four faculty will be paid for one day of scoring per semester.

Method of Assessment
To assess student progress in critical thinking skills we will incorporate critical thinking measurements at the end of each semester of general chemistry. We will monitor both student perceptions of progress on learning to think critically and creatively to solve problems, and also performance on the TTU Critical Thinking Assessment.

Dollar Amount Requested $2,000.00

Chemistry
College/Division: College of Arts & Sciences

CHEM **Goal Number: 3**

Students in the master of science chemistry program will demonstrate improved capacity for creative thinking and problem solving through developing a mini-grant proposal as part of 6000-level coursework in at least two graduate courses. Students will communicate this to their peers in class and by written report.

Relationship to Potential University QEP Focus
2 - Improve critical thinking/real-world problem solving with emphasis on communication skills.

Action Plan
The department will select two graduate level courses for implementation of an extended assignment involving the student development of a grant proposal to solve a real-world chemical problem.

Method of Assessment
Student progress in creative thinking and problem solving will be assessed by the research committees of each MS degree candidate when the student presents his or her thesis proposal as part of CHEM 6900. Also, students' perception of progress in this area will be assessed through a new MS chemistry graduate exit survey instrument now being implemented.

Dollar Amount Requested $0.00

Earth Sciences
College/Division: College of Arts & Sciences

GEOL **Goal Number: 1**

Our goal is to develop critical thinking skills and, to the extent possible, real-world problem solving by the requirement of a senior thesis (Geol 4930 and Geol 4931) for all of our majors in geosciences. We will require that all of our graduates present the results of their Senior Thesis within the department and outside of the department in order to improve their communication skills.

Relationship to Potential University QEP Focus
2 - Improve critical thinking/real-world problem solving with emphasis on communication skills.

Action Plan
A Senior Thesis was instituted as an option for our majors two years ago, but few elected to complete one. We are proposing a QEP goal that will substantially modify our Senior Thesis course sequence. We propose that all of our majors complete two consecutive 3-credit hour Senior Thesis courses as part of their degree requirements. We will require that, wherever possible, their thesis problem be selected from problems proposed by geological, governmental or private agencies, thus providing a real-world problem solving experience for many of our majors. This will be particularly appropriate for GIS majors because our GIS graduates have completed research projects for the City of Cookeville and for the Cookeville Police Department. Other possible agencies that could propose problems include, for example, the Tennessee Division of Geology (TDG). The TDG has numerous 7 1/2' geological quadrangle maps for which the geology has been largely completed, but which lack ground truthing. They do not have the resources to complete the maps and do not foresee that they will be able to do so in the near or intermediate future. One of our students could, in collaboration with TDG, complete the ground truthing and produce a digital version of the map. The digital version would become the official map version, thus allowing the TDG to make a completed map available to the public. These maps have commercial, governmental, and political information so they would benefit citizens and government of Tennessee alike. Other possible agencies with which our student could collaborate include the U. S Fish and Wildlife Resources agency, Vulcan Material Corporation, and the City of Cookeville, among others. A student could also propose his/her own problem or work on a problem proposed by a faculty member. In every case, however, the student would work under the direction of a faculty member who would monitor the student's progress and evaluate the student's end product. Also, we would expect each student to present the results of their research in order to improve their communication skills. We would require that each graduating senior present their research results within the department, at the agency with which there was a collaboration (if any), and at a meeting external to the department. We would prefer that external presentations be at regional and/or national meetings of professional societies that represent disciplines within the department. Such external organizations include the Geological Society of America and the Association of American Geographers. In some cases more local meetings such as Tennessee Tech Research Day or the Tennessee Academy of Science might be more appropriate for student presentations. We will encourage students to present the results of their research at organizations that have prizes or that judge presentations in order to provide a method of assessment that is external to the department. In order to complete field work and/or to travel to professional meeting to present research results our students will need support for field expenses, supplies, and/or travel, because those expenses are beyond what is reasonable for students to provide for themselves. Without the funds requested we will not be able to implement this program as it would impose an excessive financial burden on our students. The number of students expected to graduate in the next several years is between five and nine, so that the amount requested would meet the demand most of the time. The department has sufficient resources in an endowment fund to provide additional funding it those numbers of graduates are exceeded, although that

is not likely. Every faculty member in the department (seven) has agreed to participate as advisors for Senior Thesis. Of course, students will select their advisor so that some faculty will supervise more students than others. At the current time we do not have a really large number of seniors so that the burden will not be excessive for any faculty member, although we do not expect that the load will necessarily be evenly distributed across the department.

Method of Assessment

1) We will have instructors select relevant IDEA objectives for the Senior Thesis students that they supervise. These objective would emphasize critical thinking/problem solving categories on the IDEA instrument. Aggregate results will be maintained and we will expect these aggregate scores to increase through time if our efforts toward this goal are successful. 2) We will prepare a questionnaire wherein each student can evaluate her/his involvement in critical thinking, problem solving, and communication skills. We will expect that such self-assessment scores improve through time as the faculty become more skilled in directing Senior Thesis. Also, we believe that self-assessment scores will improve through time as departmental presentations made by our majors help create a departmental culture wherein research, problem solving, and critical thinking will be viewed as an important focus of our program by the freshmen, sophomores and juniors who attend these presentations. 3) We will identify and administer a critical thinking/problem solving test to each of our majors before and after Senior Thesis to determine if they improved their ability to think critically as a result of these two courses. We will seek assistance from faculty outside the department in selecting an appropriate instrument. 4) Some students will compete for Best Paper or Best Presentation awards at various society meetings. If our students are successful in winning some of these awards that will be an important assessment tool.

Dollar Amount Requested $3,000.00

History
College/Division: College of Arts & Sciences

HIST **Goal Number: 1**

To improve critical thinking/real-world problem solving skills by introducing the idea of simulation historical gaming within the history curriculum. This active learning method has the potential to address all areas of emphasis: communication skills, teamwork and creative learning.

Relationship to Potential University QEP Focus
1 - Improve critical thinking/real-world problem solving.

Action Plan
Given SACS approval, the department chair will introduce a simulation game as part of the syllabus for History 2410, our introductory course required of all majors. The simulation is a reconstruction of the Peloponnesian War. Students/players will familiarize themselves with ancient Greek culture, geography, religion and warfare as well as the foundation of the historical profession as their teams, representing the major city-states of the era, maneuver against the others. Should this experiment prove successful, the department faculty will consider whether simulations might prove equally successful in other courses.

Method of Assessment
IDEA forms may provide some useful assessment, but a specific instrument relating only to the simulation will also be created and used to gather student feedback. This information will be shared with faculty at an annual assessment-specific department meeting.

Dollar Amount Requested $0.00

Education Ph.D. Program
College/Division: College of Education

EDUP **Goal Number: 1**

To facilitate the development of real-world problem solving skills in students enrolled in the Ph.D. program through the use of applied practica within community-based educational, habilitative, and other learning environments. These experiences will be supervised by doctoral faculty and will emphasize collaboration, consultation and applied problem solving methods to enhance the efficacy of programs serving children and families who are deemed at-risk.

Relationship to Potential University QEP Focus
3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Action Plan
The implementation of this plan will be to take existing practica across each participating concentration area within the Ph.D. program and to design the practica experience within a community-based educational, habilitative, or other learning environment and to place emphasis on the development of a collaborative initiative aimed at enhancing the delivery of services and supports to children and families deemed at-risk.

Method of Assessment
A baseline assessment of existing practica will be conducted with the intent to redesign practica to focus on the development of consultative teams among students assigned to community-based educational, habilitative and other learning environments. Students will be given pre-training in the roles and responsibilities of consultative teams within a competency-based approach. A pre-post test measure will be utilized prior to and upon completion of training in these skills. Once student consultative teams have been formalized, student teams will be assigned a contact from the school and or agency in the community. With guidance from their faculty mentor and school or agency supervisor, students will be assigned one or more "real-world" tasks within the program. They will conduct an assessment, devise an intervention strategy, implement and evaluate the outcomes of their effort through the use of formative and summative evaluations. Student teams will meet weekly with the university faculty member and the school or agency contact and will be asked to self-evaluate their progress and obtain measures of social validity from those for whom services and supports have been provided within the school or agency.

Dollar Amount Requested $3,000.00

Health and Physical Education
College/Division: College of Education

HPED **Goal Number: 2**

Create a service learning outcome component as a graduation requirement for majors in the Health and Physical Education Program.

Relationship to Potential University QEP Focus
3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Action Plan
Develop criteria for undergraduate students to participate in a required service learning program directed toward but not limited to service in organizing and assisting in the management of the 12+ Special Olympics events sponsored yearly by the Department of Health and Physical Education. Create a survey to assess level and quality of participation and value placed on participation by undergraduate students.

Method of Assessment
Analysis of responses on participation survey.

Dollar Amount Requested $3,000.00

Industrial Technology
College/Division: College of Engineering

MIT **Goal Number: 1**

Require a capstone experience, which emphasizes 1) teamwork, 2) individual skills in identifying and solving a real-life industrial problem, and 3) oral and written communication skills

Relationship to Potential University QEP Focus
3 - Improve critical thinking/real-world problem solving with emphasis on team work skills.

Action Plan
The student groups are required to: 1) contact a local industry and identify a problem, and 2) apply skills and knowledge acquired during their course of study to solve the problem to industry satisfaction before graduation.

Method of Assessment
Toward the end of the semester, the students are required to present their project finding before an audience of peer students, faculty, and industrial partners. A specially designed assessment form is filled by the jury audience to 1) demonstrate that they can translate their learning into worthwhile action by solving problems, and 2) understand and are aware of interrelationships among basic knowledge, technical advance, and human needs.

Dollar Amount Requested $0.00