ABET

2ND ABET INTERNATIONAL FACULTY WORKSHOP FOR CONTINUOUS PROGRAM IMPROVEMENT

National University of Singapore
Singapore
December 9-11, 2003

Original Exercises

ABET Faculty Workshop for Continuous Program Improvement

Fictional Case Study

NATIONAL INSTITUTE OF TECHNOLOGY

National Institute of Technology (NIT) is a public, university with a tradition of strong professional technology programs and equally strong science and liberal arts programs. NIT is one of four engineering colleges in the country. NIT is acknowledged to be the premier school for engineering in the country with many notable alumni, including the Prime Minister who graduated in civil engineering, and five of the top level Ministers in the current administration. Engineering has been a part of NIT since the 1950's. In the engineering college there are undergraduate and graduate programs in electrical, mechanical, civil, and industrial engineering. There are 2100 undergraduate students enrolled in the four engineering programs, with 630 in the electrical program, 580 in civil engineering, 425 in mechanical engineering, and 465 in industrial engineering. There are also 275 students enrolled in the master's and Ph.D. programs in the college.

Admission to the Institute is based on the results of the national comprehensive exam that every high school student is required to take prior to graduation. Engineering and medicine routinely attract the top students from across the country. This year's entering class in the engineering college had 50% of the entering students placing in the top 5% in the test, and 95% of the students scored in the top 15% of the total test takers. In electrical engineering, 50% of the entering class scored in the top 2%, and 90% were in the top 8%. Five percent of the entering class spots in the college are reserved for disadvantaged students from a minority population in the remote rural northern portion of the country. Ninety percent of the engineering students are the first in their family to attend college. Foreign students and transfer students are relatively rare and account for less than 1% of the total student body in engineering. The Institute graduates 87% of the engineering students in six years.

Faculty members are recruited who have demonstrated a strong commitment to high quality undergraduate and graduate education. There is a total of 105 full-time faculties in the engineering college, and depending on the specific semester, anywhere from 20 to 40 adjunct faculty recruited from local industrial entities. The full-time faculty is comprised of 60 who have an earned doctorate, 25 with a master's degree, and 20 with a bachelor's degree. (In electrical engineering the numbers are 18, 8, and 4, and 4 to 10 adjuncts) Those with a Ph.D. are generally below 45 years of age, and those without the Ph.D. are generally over 50 years of age. Most of the Ph.D. faculty received their undergraduate degrees from NIT, and then were sponsored by NIT to attend graduate school at premier engineering colleges in the United States or Europe. As a result, the CV's of the faculty indicate graduate degrees from a wide diversity of universities, but usually from the most prestigious programs in their respective disciplines.

The economy in Capital City and province, where NIT is located, has experienced a rapid industrialization over the past 10 to 15 years. The backbone of the economy is now high-tech, electronic components based. The economy in the remainder of the country is primarily based

on agriculture and timber harvesting. This rapid industrialization in Capital City and the surrounding province has resulted in several problems, including a shortage of skilled labor in the manufacturing plants, lack of proper infrastructure (including the electric power grid), traffic congestion and the resultant smog, and inadequate sewer and potable water infrastructure. NIT, as the premier engineering college in the country, is being looked to as the primary technological entity to help solve these problems.

Most of the research conducted by the faculty is sponsored by local industry, and almost all of the faculties have full-time industrial experience working with the local companies. NIT encourages the obtaining of this industrial experience by permitting 20% of the faculty's time to be devoted to industrial consulting, during the academic year, and full-time employment during breaks between academic years.

The Institute is preparing for an ABET substantial equivalency visit in 18 months. As soon as the NIT faculty became aware of the development of the outcomes based engineering criteria , they began considering applying for a substantial equivalency visit. The Dean described the ABET process to the Rector and Vice-Rector, and they directed the Dean to apply for the ABET substantial equivalency evaluation. The Vice-Dean for Academic Affairs, and two faculty from each of the four programs began meeting and planning for the apparent challenge that would face them. Currently, there are no institutional or national assessment, accreditation, or certification programs in effect.

NIT electrical engineering faculty members engaged in various activities to determine the needs of their constituencies as a first step in establishing the Educational Objectives of their program. First, they decided to focus on the following constituencies: employers, students, parents and faculty.

The faculty members then decided to conduct a survey of each group for the purpose of determining the needs of each constituency. The results of these surveys are summarized in the paragraphs that follow.

It was clear that employers want graduates who have the technical knowledge needed for each of their fields of interest. All of the fields of interest were listed and reviewed by the faculty. The ones judged to be most important for the future needs of the province and the nation were those dealing with electrical power generation and distribution, manufacturing and production systems, electronic communications, and computing systems.

Most of the employer respondents expressed a major concern about many, if not most, college graduates not understanding the impact of globalization on their economy and the "profit motive" of companies. The employers also believe that it is important to expose students to the concepts inherent in what it takes to be an entrepreneur in the rapidly expanding economy. In contrast, the government-run electric power company seeks graduates who are prepared to work in government organizations. The respondents from the government sector, although few in number, predicted the need for a large number of graduates during the next five years because of the rural electrification program and the large power needs required for the high-tech manufacturing facilities that were being built throughout Capital City and the surrounding province. The faculty reviewed these results and concluded that their graduates need to be

prepared to accept responsibility as engineers and to begin working effectively in either "for profit" or government organizations.

Many employers expressed concern that a significant portion of recent college graduates does not have the proper motivation. They worry about the impact of MTV and other culturally degenerative influences on the younger generation. The graduates seem more concerned about "getting a pay check and having a good time" than working hard to reach the goals of their employer and to strive for personal achievement. The faculty concluded that the graduates need to be motivated to develop their knowledge and skills after graduation in order to succeed personally and to assure employer success.

Review of the survey results for electrical engineering showed that employers need graduates who are prepared to begin working in an environment that requires the development of knowledge and skills to serve in a variety of roles such as project engineer, sales engineer, product design team member, field engineer, interface with suppliers, interface with customers and a variety of positions that require interaction with persons with non-technical training. The employers believe an especially important trait is the ability to supervise and interact with an unskilled work force that must be trained to work in the high-tech manufacturing plants.

Survey data from students enrolled in the electrical and electronic engineering program, high school seniors in the province, and parents of high school students showed that the primary concern is "learning enough" to be employed as an engineer immediately following graduation. The faculty reviewed these data and concluded that this constituency expects to acquire the knowledge and skills that are needed for first employment as an electrical or electronic engineer. The data also showed that the students and parents want graduates not only to be employed but also to have happy and rewarding lives. A few students and parents expressed hope for success as a corporate executive or researcher. None expressed a goal of being a college professor.

Also, the survey data showed that parents expect their investment and that of their child to pay off immediately and to help improve the living conditions of the extended family.

The faculty members, including four senior electrical engineering faculty who will retire prior to the ABET visit and four new faculty, concluded that they represent a fundamentally important constituency and must be surveyed as well. The results showed the following priorities. Most faculty members believe that their opportunities to explore and develop new knowledge needed for the development of the country and the advancement of the field of electronic and electrical engineering is most important. A close second is their opportunities to work with students as teachers and advisers. Some believe that the development and refinement of their techniques and methods of teaching are important. A lesser portion viewed the development of new curricula as important.

The Educational Objectives of the program were finalized as shown on the next page. It was decided that in accordance with the evaluation requirements of Criterion 2, a survey of graduates, parents of graduates, employers and faculty would be conducted in four years to determine how well these objectives are being achieved. A plan for this is shown on page 4.

After the Program Educational Objectives of the program were finalized, the faculty member's crafted statements of what they expect each student to achieve and demonstrate by the time of graduation. Each statement focused on knowledge and/or skills that can be demonstrated through examinations, group or team activities, project reports or presentations, and the student's commitment to completion of the required program of studies. These are shown as Program Outcomes on page 5 and the process for assessing the outcomes is shown on page 6.

NATIONAL INSTITUTE OF TECHNOLOGY

Electrical and Electronic Engineering

Educational Objectives

Produce graduates who:

Practice electrical engineering in the following applications areas: electrical power generation and distribution, manufacturing and production systems, electronic communications, and computing systems.

Accept responsibility as an engineer in industrial and government organizations.

Will become leaders in the industrial development of the country.

Develop their knowledge and skills after graduation to succeed personally and to assure employer success.

Work in an environment that requires the development of knowledge and skills to serve in a variety of roles including defining and diagnosing problems, developing and implementing solutions to problems with technical and non-technical elements, designing devices and systems, serving as a team member, and leading others.

Have productive and rewarding lives and will serve as role models to the next generation of students.

Believe that their engineering education was a wise investment.

Provide education through faculty members who:

Teach, advise and help students acquire the knowledge and skills required for beginning electrical engineers.

Develop new knowledge and skills for the practice of electrical engineering.

Actively consult with local high technology firms in their fields of expertise.

Develop new techniques and methods for teaching, advising and helping students acquire the knowledge and skills required of beginning electrical engineers.

Develop program and course curricula that provide the knowledge and skills needed by beginning electrical engineers.

NATIONAL INSTITUTE OF TECHNOLOGY

Electrical and Electronic Engineering

Assessment/ Evaluation Process for Educational Objectives

After careful review of the evaluation requirements of the ABET Engineering Criteria, the faculty decided to develop a set of processes that would meet the requirements of Criterion 2. Note that surveys had already been completed to provide a basis for choosing the Program Educational Objectives.

As previously decided a survey of constituencies would be conducted to determine how well the Program Educational Objectives were being achieved. A separate set of questions is to be prepared for each constituency based on the objectives that apply to the respective constituency. The questions are to be designed to determine if the relevant objectives are being achieved and if these objectives address the needs of the respective constituency. These surveys are scheduled to be conducted once every four to six years. The results will be used in two ways. First, if the data show that any of the objectives are not being met, consider how this finding relates to the outcomes required of all students. Second, if any unmet needs are identified, consider if the educational objectives and/or program outcomes should be modified.

NATIONAL INSTITUTE OF TECHNOLOGY

Electrical and Electronic Engineering

Program Outcomes

Each Electrical Engineering graduate will demonstrate the following before graduation:

Knowledge of scientific principles that are fundamental to the following applications areas: electrical power generation and distribution, manufacturing and production systems, electronic communications, and computing systems.

Ability to analyze and solve complex problems that deal with applications in three of the applications areas.

Ability to complete a comprehensive design problem in one of the application areas incorporating the use of design standards and realistic constraints that include most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social and political.

Understanding of the expectations of an engineer who practices in an industrial or governmental organization.

Commitment to continue developing knowledge and skills after graduation.

Commitment to succeed personally and to assure employer success.

NATIONAL INSTITUTE OF TECHNOLOGY

Electrical and Electronic Engineering

Assessment/Evaluation Process for Program Outcomes

Criterion 3 requires that each program must have an assessment process with documented results and evidence that the results are being applied to the further development and improvement of the program.

The faculty members agreed that any commitment to improvement would be successful only if each faculty member accepts responsibility for improvement within each course they teach. Thus, it was decided that fulfillment of the program outcomes would be achieved through specific "points of learning" being achieved within each course. Each faculty member developed a set of "points of learning" for each course they teach. Working together the faculty created a matrix showing how the "points of learning" within each course relate to the Program Outcomes. At the end of each course two sets of survey instruments are completed relative to the applicable "points of learning." First, each student is expected to complete a survey form for each course that expresses the extent they believe they achieved each "point of learning." Second, each faculty member is expected to complete the same form that expresses how well the class as a whole achieved each "point of learning." The averaged data from the student surveys are compared to the faculty member's perception to provide feedback for improvement. The faculty member is required to provide a report to the department chair describing how the next offering of the course will be altered based on the feedback.

The course evaluation data are accumulated as each class progresses toward graduation. Data from the outcome requirements are compared to the course evaluation data to provide indicators of areas for improvement.

ABET International Engineering Faculty Workshop

Typical Provincial University Exercise

Introduction to Exercise

The participants at your table are the faculty members for your assigned program at Typical Provincial University (TPU). Your mission is to write a set of Program Educational Objectives with evaluation methods, and Program Outcomes with assessment methods for your program taking into account the requirements of EC2000, these instructions and what you have learned during this workshop.

This document presents background information that you should use in completing your assignment and specific instructions for preparing four written documents.

Institutional Mission

The mission of Typical Provincial University is to serve the citizens of the province through instruction, research and service. The publicly stated mission is to:

Provide general and specialized education through undergraduate and graduate degree programs;

Conduct basic and applied research within the instructional program areas;

Facilitate the use of the research results for the betterment of the lives of the province's citizens; and

Support the economic develop of the province by providing education and research programs that are responsive to the needs of industrial and government organizations and the needs of individual citizens.

Degree Title and Program Modes

A Bachelor of Science degree in your assigned area will be awarded to a student who completes the program of study. The program is offered during the day in a traditional campus setting where the average undergraduate student age is 21 years.

Historical Background

Typical Provincial University was founded in 1950 as the Homeland Teachers Institute under the auspices of a consortium of religious organizations. The Institute was donated to the province in 1960 to become the province's technological institute. A course in land surveying was the basis for developing a Bachelor of Arts degree in the Mechanical Arts. From this humble beginning, engineering faculty and courses were gradually added and the School of Engineering was formed in 1970 and offered only undergraduate engineering degrees. Programs in civil, mechanical and electrical engineering were developed.

In the 1980's several new specializations were developed to meet the needs of a rapidly growing economy. Faculty members were increasingly challenged to seek national government and World Bank research funds. The name of the school was changed to the College of Engineering Sciences in 1985 and all programs in engineering were approved to offer masters of science and doctor of philosophy degrees in 1995.

There is no national accreditation system for engineering programs, so the administration decided to seek substantial equivalency evaluation from ABET. Ten faculty members are responsible for the undergraduate and graduate degrees for the program area to which you have been assigned. Total undergraduate enrollment in the program (sophomore through senior) averages about 200. Approximately 60 students graduate each year.

General Background

Students are admitted to pre-engineering as freshmen. All pre-engineering students must complete the first year of courses with a grade of C or better before being admitted to an engineering major. Most of the students in engineering enroll as freshmen. Approximately 20% of the graduates enter the program by transferring from regional colleges outside of this province. By provincial law TPU must accept such transfer students if they have a 2.0 grade average and courses declared equivalent to those at TPU must be accepted toward any applicable degree.

Constituency Information

Most students who graduate from your assigned program become employed within the province. In recent years, approximately 20% completed masters degrees within five years after graduation. Approximately 50% of those seeking graduate degrees go to universities in the United States. A few graduates continue to complete doctoral degrees in engineering and other fields.

A survey of alumni that was conducted three years ago indicated most felt that the curriculum had prepared them well for their first job experience. Suggestions for changing or improving the program included the following:

Place more emphasis on use of modern software engineering tools.

Increase the number of assignments that require written and oral reports.

Add material to the curriculum on business practices.

Reduce the advanced mathematics requirement.

The survey results indicated that the alumni who had work experience before graduation enjoyed their first engineering assignments more than those who had little or no work experience. Overall, the alumni were pleased with the education they received at TPU, but they believed the curriculum should be oriented more to industry needs with less emphasis on theory.

A survey was conducted of companies known to have employed TPU graduates during the past six years. The survey results indicated that 60% of the employers had a positive impression of the quality of TPU engineering graduates. The remainder indicated they did not have enough specific knowledge to answer the question. None of the responses indicated a negative impression. Over 40% of the employers indicated they expected to hire new engineers during the next year and they would recruit on the TPU campus. More than one-half of the surveys sent out were not returned.

Substantial Equivalency Preparation

The department head and the faculty of your assigned program are somewhat familiar with ABET's transition to an outcomes based assessment process. They have been monitoring the transition to the new engineering criteria by attending ABET International Seminars in Istanbul and Singapore, by reading journal articles, by hearing papers at national meetings and reading documents made available on the web by ABET. You anticipate you will be prepared for a substantial equivalency visit in about two years. The faculty decided to begin their outcomes based assessment efforts by focusing on writing their Program Educational Objectives first as required by Criterion 2 and then writing Program Outcomes as required by Criterion 3. Once the outcomes and objectives are believed to be consistent, the faculty plans to develop detailed plans for evaluation and assessment processes.

Group Exercise

Step One: Program Educational Objectives

Using the two workshop cases as examples, the attributes and plans you developed in this workshop, and the background information provided above, compose a set of Program Educational Objectives your group believes meet the requirements of the engineering criteria Basic Level Accreditation Criteria and the Program Criteria for your assigned area. For each Objective describe one or more evaluation methods that could be used to demonstrate that the objective is being achieved.

In your work, assure that the following parts of Criterion 2 are being met:

Each engineering program for which an institution seeks accreditation or reaccreditations must have in place:

(a) Detailed published educational objectives that are consistent with the mission of the institution and these criteria

(b) A system of ongoing evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the program

Step Two: Program Outcomes

Again using the two workshop cases as examples, the attributes and plans you developed in this workshop, and the background information, compose a set of Program Outcomes that you believe are consistent with the Objectives and meet the requirements of the engineering criteria Basic Level Accreditation Criteria and the Program Criteria for your assigned area. For each outcome describe one or more assessment methods that could be used for continuous improvement and/or to demonstrate that the outcome is being achieved.

The list of outcomes should be responsive to the program educational objectives you prepared during the previous session. The outcomes should describe the knowledge and skills students need to assure they will achieve the objectives after graduation.

In your work, assure that the following parts of Criterion 3 are being met:

Engineering programs must demonstrate that their graduates have:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Each program must have an assessment process with documented results. Evidence must be given that the results are applied to the further development and improvement of the program. The assessment process must demonstrate that the outcomes important to the mission of the institution and the objectives of the program, including those listed above, are being measured.

Step Three: Report Preparation

Your facilitator will take about 30 minutes at the conclusion of the morning session to discuss with both groups in your room the important things you have learned about Program Educational Objectives, Program Outcomes, and the associated evaluation and assessment processes. Make a ranked list of three or four items of new knowledge you have gained during the morning session.

ABET Faculty Workshop For Continuous Program Improvement
Objectives Exercise

Exercise 1

Step One

Use the sample standards extracted from ABET Criteria as a guide. Take the perspective of an external consultant evaluator during this step. List below the **strong** and **weak features** of the program educational objectives published in your pre-read institutional case study.

After each person at your table has had time to prepare a list, compare and discuss your lists with other participants. Revise your personal list based on your discussions **before** moving to **Step Two**.

STRONG FEATURES	WEAK FEATURES

Proceed to Step Two When Your Group Has Completed Discussion of the Features

ABET Faculty Workshop For Continuous Program Improvement

Objectives Exercise

Step Two

Now that you have discussed the strong and weak features of the example objectives, please discuss within your group the **attributes** that acceptable Program Educational Objectives should have to meet the sample standards. Try to agree on a common list for your table. Keep your list for use in later exercises.

Please Prepare One List for Your Table

Attributes of Well Stated Program Education Objectives

ABET Faculty Workshop For Continuous Program Improvement
Outcomes Exercise

Exercise 2

Step One

Participants critique program outcomes in the pre-read institutional case study.

Using the Program Outcomes that the faculty developed for the program in the pre-read institutional case study compare and contrast the set of program outcomes in contrast to the sample standards extracted from the ABET Criteria. It may help you to take the perspective of an external consultant evaluator during this step. List below **strong** and **weak features** of the program outcomes statements that you identify.

After each person at your table has had time to prepare a list, compare and discuss your lists. Revise your personal list based on your discussions before moving to Step Two.

STRONG FEATURES	WEAK FEATURES

Proceed to Step Two When Your Group Has Completed Discussion of the Features

ABET Faculty Workshop For Continuous Program Improvement

Outcomes Exercise

Step Two

Now that you have discussed the strong and weak features of the example outcomes, please discuss within your group the **attributes** that acceptable Program Outcomes should have in view of the sample standards. Try to agree on a common list for your table. Keep your list for use in later exercises.

Please Prepare One List for Your Table

Attributes of Well Stated Program Outcomes

Exercise 3

Read the Plan from the Pre-read Case Study
Proceed to Step One

A Plan for the Assessment & Evaluation of Educational Objectives

Strategic management and delivery of high quality technical programs require that each program have plans for continuous improvement and evidence that assessment results are applied to the further development and improvement of the program.

Step One: Participants Critique the Case Study Plan

Critique the adequacy of the Assessment and Evaluation Plan presented by the fictional case study. Start by listing all of the steps that you believe are necessary to both meet the educational objectives and evaluate their achievement in a reasonable time; and then determine where the plans do and do not include or satisfy your expectations of those steps.

Proceed to Step Two When Directed by the Facilitator

Step Two: Participants Develop a Model Plan

Prepare a practical assessment & evaluation plan that will (a) determine the extent program educational objectives are being achieved, (b) result in continuous improvement changes in the instructional program, and (c) indicate needed and appropriate adjustments to program educational objectives or institutional practices. Include time lines for each step in your plan and an estimated time to complete the first cycle of the entire plan. Make sure all critical steps are included in your plan.

To facilitate the exercise, limit the development of your plan to the two educational objectives provided below.

Objective 1: Produce graduates who can function effectively as electrical engineers for the provincial and national government and non-government employers that deal with manufacturing and production systems, communications electronics, telecommunications and computing systems.

Objective 2: Produce graduates, who will function individually and in teams, both professionally and socially, practice ethical conduct in their responsibilities, and communicate effectively.

It may be helpful to consider the sample questions below to guide your work. **Do not assume that these questions are a complete list or that they are the right questions. They are provided just to stimulate your thinking and the discussion of your group.**

What assessment tools will be used? (Defend your rationale for the particular tools you have chosen.)
What will be measured?
What data will be collected?
Who will be involved in the assessment and evaluation activities?
Who will be responsible for what in the process?
How often will data or other evidence be collected and analyzed?
What analysis will be done on the collected data?
What actions or changes will result from the data analysis?

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Exercise 4

Read the Plan in the Pre-read Case Study
Proceed to Step One

A Plan for the Assessment and Evaluation of Program Outcomes

The foundations of a continuous improvement program are assessment and evaluation processes that produce documented results. Evidence gleaned from assessment is the factual data upon which focused and periodic decisions are based that will further the development and improvement of the program. These processes are used to demonstrate that the program outcomes necessary to fulfill the educational objectives are in fact being achieved.

Step One: Participants critique the Pre-read Case Study assessment and evaluation plan.

Critique the adequacy of the Assessment and Evaluation Plan presented by the fictional institution. Start by listing all the steps that you believe are necessary to both meet the program outcomes and evaluate their achievement at the appropriate time; and then determine where the plan does or does not include or satisfy your expectations of those steps. Discuss how these steps will differ from those that you developed for evaluation of educational objectives. Consider how well the plan will determine the extent to which the program outcomes meet the performance level of the ABET EAC Criteria.

Step Two: Participants Develop a Model Plan

Prepare a practical assessment and evaluation plan that will a) demonstrate achievement of the program outcomes that are necessary to fulfill the educational objectives of the program, b) meet the performance level of the EAC Criteria, c) provide structured guidance for continuous improvement of the program and d) critique the relevance, currency, and efficacy of stated program outcomes. Include time lines for each step in your plan and an estimated time to

complete the first cycle of the entire plan. **Choose at least two assessment tools for each outcome, and be prepared to defend your rationale for the particular tools you have chosen.** Make sure all critical steps needed to ensure improvement of the program and demonstrate achievement of the outcomes are included in your plan.

To facilitate the exercise, limit the development of your plan to one outcome for Objective 1 and one outcome for Objective 2.

Objective 1: Produce graduates who can function effectively as electrical engineers for the national and provincial government and non-government employers that deal with manufacturing and production systems, communications electronics, telecommunications, and computing systems.

Program Outcome 1a: ability to complete a comprehensive design problem in one of the application areas incorporating the use of design standards and realistic constraints that include most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social and political.

Program Outcome 1b: Graduates will be able to communicate the results through a combination of oral and written reports.

Objective 2: Produce graduates, who will function individually and in teams, both professionally and socially, practice ethical conduct in their responsibilities, and communicate effectively.

Program Outcome 2a: Graduates will communicate their ideas and the applications of electrical engineering to team members in a simulated manufacturing environment using written, oral and graphical methods.

Program Outcome 2b: Graduates will demonstrate the professional responsibilities expected in manufacturing in assignments in which social conflicts exist.

Exercise Analysis

Facilitator: Steadman

Points of Learning

1. Difference between objectives & outcomes
2. Logical & complete process of formulating PEO, Outcomes, & Assessment
3. Methods for assessment & evaluation & importance of measurement
4. PEO are only part of dept., college, university, and mission
5. EC2000 focus is on continuous quality improvement
6. ABET evaluators assist the program to improve
7. Criteria includes both technical & non-technical requirement
8. Done right, ABET accreditation is ongoing and done fro making program better not an inspection "Not an end in itself".

Table A

Attributes of Well Stated Program Educational Objectives

1. Align with the institution's mission
2. Meet the needs of most constituents
3. Demonstrate Uniqueness of the program
4. Should be achievable
5. Should be measurable

Attributes of Well Stated Program Outcomes

1. Should be related to program objectives
2. Should be realistic and measurable
3. Should be least cover criteria a-k outcomes (Criteria3)
4. Should meet the specific program criteria for the electrical engineering (Criteria 8)
5. Should be a package of: knowledge – skills – attitude – behavior

PEO Statements

Practice EE in gov't & industry
Develop knowledge & skill after graduation
Conduct course & applied research & pursue graduate studies

PEO's Evaluation

Indirect – Conduct surveys of alumni and employer every 2 years - a committee and of faculty will be responsible of this

Direct – Data from licensing of professional institutions – sample of survey questions: practice EE in gov't & industry

Alumni survey (1=poor, 2=fair, 3=adequate, 4=well, 5=very well):
Q1: Have you practiced EE since graduation? (Performance indicator: 60% yes)
Q2: Has your EE education at TPV prepared you to practice EE (1,2,3,4,5) (performance indicator 60% >/ 3)

Facilitator: Steadman

Q3: Compared to your peers, who graduated from other universities, do you consider yourself better able to practice EE (1-5) (performance indicator: 60% >/ 3)

Outcomes
(c) an ability to design a system, component, or process to meet desired needs.

Direct Method: simulation (final year project) and local examination

Indirect Method: Course instructor will submit course portfolios
Student survey, instruction survey, external examiner of program and course

Mapping of course (having design component) to program outcome

The averaged data from the student surveys are compared to the faculty members perception to provide feedback for improvement. The faculty member is required to provide a report to the department chair describing how the next offering of the course will be altered based on the feedback.

Outcomes
(g) an ability to communicate effectively
Direct assessment method; (i) seminar, (ii) project report, and (iii) examination

Performance indicators:

(i) Audience feedback (scale 1 to 5) on target score >/ 3
(ii) Test score for report writing/presentation 80% of students >/ 70% (test score)
(iii) 80% of students >/ 70% (test score)

The survey schedule of 4 to 6 years to be changed to 3 to 4 years

Questionnaires to be in data bank from constituents (e.g. advisory committee, employers, graduates)

Graduates: continuing education program attended, career growth path, responsibility, & job scope

Employers: graduates meet their expectation in terms of knowledge, commitment, leadership, sense of responsibility, capability to manage change and solve problems. Ability to work as a team with multi-discipline team members.

Advisory committee: graduates have knowledge and skills needed for the specific industry. Ability to manage change. Leadership and ability to lead a team to solve problems of complex social and economic needs.

The data to be collated and evaluated for validation.

Facilitator: Steadman

Table B

Most desired attributes for PEO

1. Address constituents
2. Not focus on short term goals only
3. Not to narrow
4. Measurable
5. Uniqueness of program
6. Express – knowledge, skills, and attitudes
7. Coherence or a common thread
8. Communicate effectively to a non specialist audience

Program Outcomes

Design and conduct experiments, as well as analyze and interpret data and communicate effectively.

Direct 1 & 2
Exploratory experiments

Attributes
Design experiment to satisfy
Conduct
Analyze data
Interpret/model
Conclude/evaluate

Student assessment
Oral present
Discussion (std grp)
Peer assessment
Report - show attributes and faculty assessed

Database
2^{nd} & 3^{rd}

Independent
Assessor/faculty
Indicators
Performance criteria
Progression as 2^{nd} and 3^{rd}

Indirect
Exit survey
Focus group employers

Facilitator: Steadman

2nd (25%)
3rd (50-80%)

PO 2
Module – professional communication exams/CA – Direct
Projects – oral/written presentations – Direct
Reports – communication – Direct
Seminars –
Archival records – publications/research – Direct
Employer survey
Focus group – alumni - Direct/indirect
Employer – indirect

Program Educational Obj
Produce graduates who:

1. Have knowledge and skills to practice as electrical engineer
2. Can conduct basic and applied research in areas of electrical engineering
3. Will pursue continuous advancement of knowledge & skills

Assessment 2 – basic/applied research
Direct
Research o/p on IEEE, web of science, patents, growths
Research papers/citations/impact factor
2 yrs. Patents/tech transfers
Companies
Funding, grants, etc.
Indirect
Alumni survey – check research o/p
2 yrs. Focus group of employers and industrial consortium

PEO (1) – 2 yr after graduation
Alumni survey indirect
Skills
Oral/written communication skills Scale 1 – 5
Problem solving Scale 1 – 5
Engineering science & math Scale 1 – 5
Software skillsScale 1- 5

Direct
Project portfolios
Focus groups – employer

Facilitator: Steadman

Project team with individual components
1. Project with design, economics, environment manufacturing

Criterion based assessment
Design
Process/project plan
Working demo
End of project oral presentation individuals & team
Written report individual and peer assessment

2. Simulated/sole playing exercise

Technology assessment project

Customer/student	Manager/student
Conflict resolution	output
Ethics/health and safety	design, feasibility, business plan, report

Collect student project for VCS elevator pitch portfolio of project (independent/external assessor)

Exit survey of graduates and employers from feedback survey
Focus group students

Plan of Assessment PEO

Objective 1

Main words function effectively Engineering functions of manufacturing and telecom

Objective 2

Practice, ethics, responsibilities and communicate effectively

What to look for

1. Job profile of recent graduates

Responsibilities Ethics PE Certificate

2. Effective communication

How to achieve and what to do
Exit survey graduates every year from alumni database and job profile/progress
Employer's survey of 2 years
- Technical competence
- Communication skills
- Teamwork

Focus groups of 1 year
- Industrial consultative
- Alumni dinners
- Open houses with parents and society

When to analyze? (Rethink PEO)

Facilitator: Steadman

4 years? Slower sampling for feedback of 100 P PEO then
change PEO. Feedback also relates P Outcome or curriculum small changes outcomes close minor loop taster rate

Exercise 2
The last three outcomes an hard to measure
Outcomes did not address the basic knowledge e.g. outcome a
Some outcomes are not consistent with the objectives

Step 2
Outcomes should be consistent with objectives
Should cover a-k outcomes
Outcomes should be measurable, measurable within a time frame
Should be clearer and concise for students and faculty

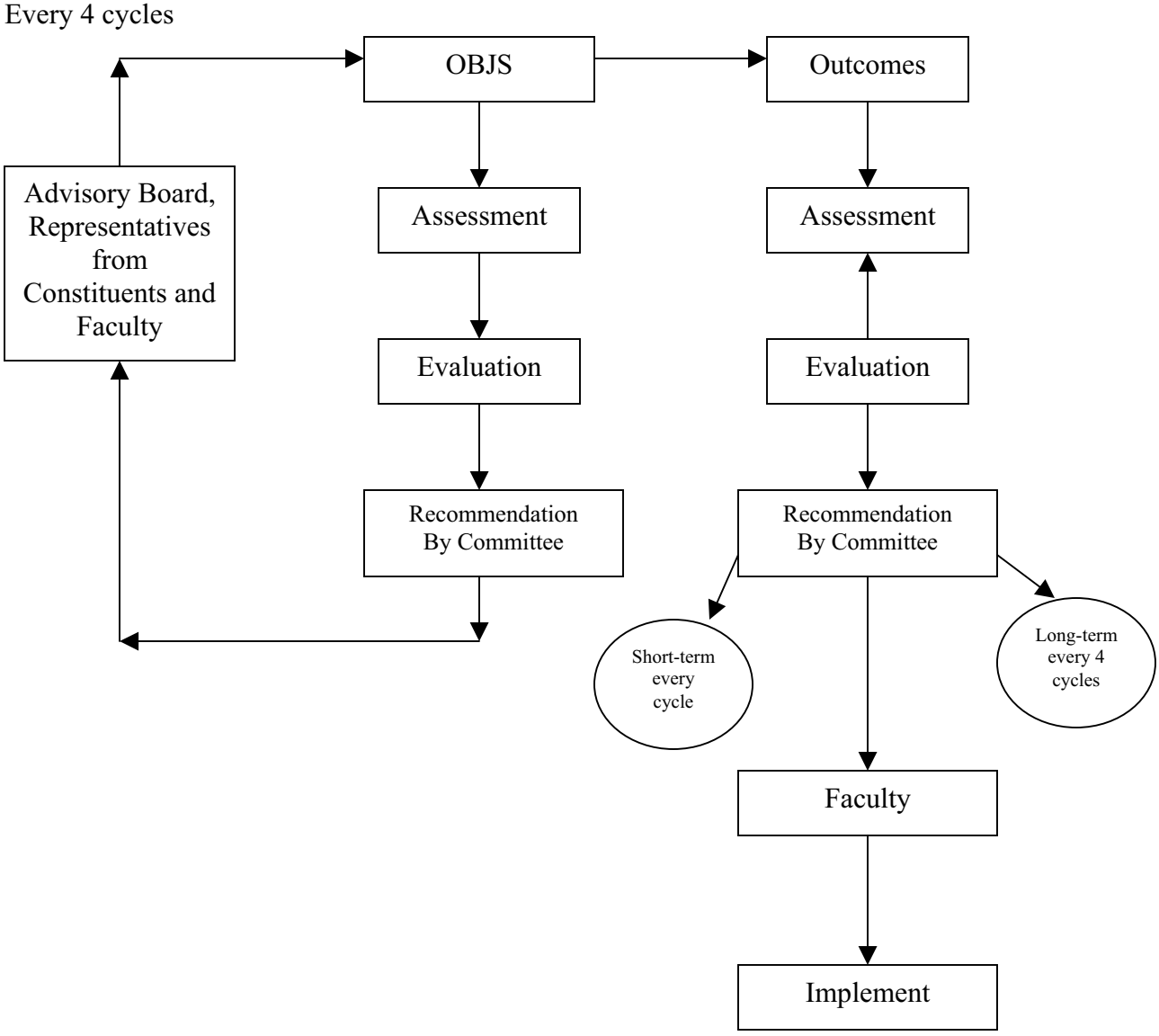
Facilitator: Rutherford

Points of Learning

1. Outcomes VS Objectives
2. Different assessment methods
3. Measurable Quantifiable
4. Process in place
   a. Documentation
   b. Following the process

Table A

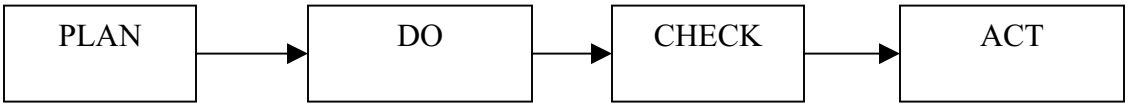
Figure 1: Assessment Evaluation Process for Educational Objectives



Facilitator: Rutherford

OBJS
Produce graduates who are able to:

1. Function effectively as mechanical engineers in industrial and government organizations to support growth of the province's economic developments.
2. Contribute to basic and applied research in mechanical engineering relevant to needs of province and its citizens.
3. Function individually and in multi-disciplinary teams, both professionally and socially, practice ethical conduct in their responsibility.
4. Demonstrate leadership qualities, and communicate effectively.



Exercise 3
Committee of industry and faculty:

Assessment	Assessment Methods
Obj 1/2	1 & 7 (survey and portfolios/1 & 9 (survey, performance appraisal)

Analysis/Evaluation (3 yrs)
Data collection: alumni survey, employers
Pilot run: full implementation
Statistical Analysis: Quantitative/Qualitative and Recommendation to faculty/Proposals

Exercise 4
Step 2
Program Outcome 1B

Communicate effectively:
Oral examinations/Presentations and written reports
Who does it?

Faculty: course work, project work, thesis, passing grade
Employers: during internship, appraised by employer at end of internship, feedback from faculty, and pass or fail grade

Program Outcome 2A
Step 2
Communicate to team members:
Have a simulated manufacturing environment/company
Quarterly department strategies reviews: mission objectives, rating by themselves, and presentation on objectives for next quarter

Facilitator: Rutherford

Table B

Assessment and Evaluation
Target: 2-4 years work experience

Obj 1: Surveys – employer, every year
Archival records – employees, every year

Obj 2: Surveys – employee and employer, every year
Archival records – employees
Interviews – employee and employer

Facilitator: Rutherford

Obj 3: Surveys – employee and employer, every year
Interviews – employee and employer, every year
Archival records – employee, employer and 3rd party surveys
Focus groups – round table meetings

Obj: 4: Archival records – selective tracking of leaders indefinitely
Focus groups – round table meetings

Outcomes

a. Abilities to apply knowledge of mathematic, science and mechanic engineering
b. Ability to design and conduct experiments, analyze and interpret data
c. Ability to design 3M and thermal systems components of processes to meet desired needs
d. Abilities to function in multi-discipline team
e. Abilities to identify, formulate and solve engineering's problems in 3M systems
f. Understanding of professional and ethical responsibilities
g. Communicate effectively, including technically in the content of M.E.
h. Broad education to understanding impact of engineering's solutions in a global and societal context
i. Ability to engage in life-long learning
j. Knowledge of contemporary issues
k. Ability to use technology, skills, and modern engineering tools needing for engineering practice
l. Ability to model, simulate and analyze 3M systems using software tools

Facilitator: Rutherford

Outcome	Assessment methods	Targets	Duration, every year during regular exam in course	Corrective measures
A	3, 4, 5, 9, 10, 11	Students all		
B	9,5, 11	3rd and 4th		Continuous improvement recommendation done at end of each cycle and pilot runs
C	5,7,9,10,11	>/ 3rd		
D	1,9,11,12	>/ 3rd		
E	4,5,9,11	>/ 3rd		
F	2,6,12			
G	9,11,2			
H	2,3,6			
I	1,2			
J	1,2,3			
K	1,7,8,9	>/ 3rd		
L	4,5	>/ 3rd		

Exercise 1

Step One

Strong Features

1. Some objectives are clearly stated and are measurable
2. Objectives address the needs/requirements of the constituencies

Weak Features

1. Some objectives are either difficult to measure or not measurable.
2. The vision-mission of the institute and the department is not stated.
3. Graduate school as a constituent is not mentioned.
4. Part 1 and Part 2 of the program objectives are not consistent.

Attributes of Well Stated Program Education Objectives

1. Measurable
2. Consistent with the vision and mission
3. Meet the needs/requirements of the constituencies
4. Develop a curriculum based on the stated objectives

Facilitator: Rutherford

Exercise 2
Step One
Strong Features

1. Program outcomes satisfy ABET criteria a, c, e, partially f, I, partially j, and k
2. Comprehensive criteria for design activity
3. Additional 2 criteria

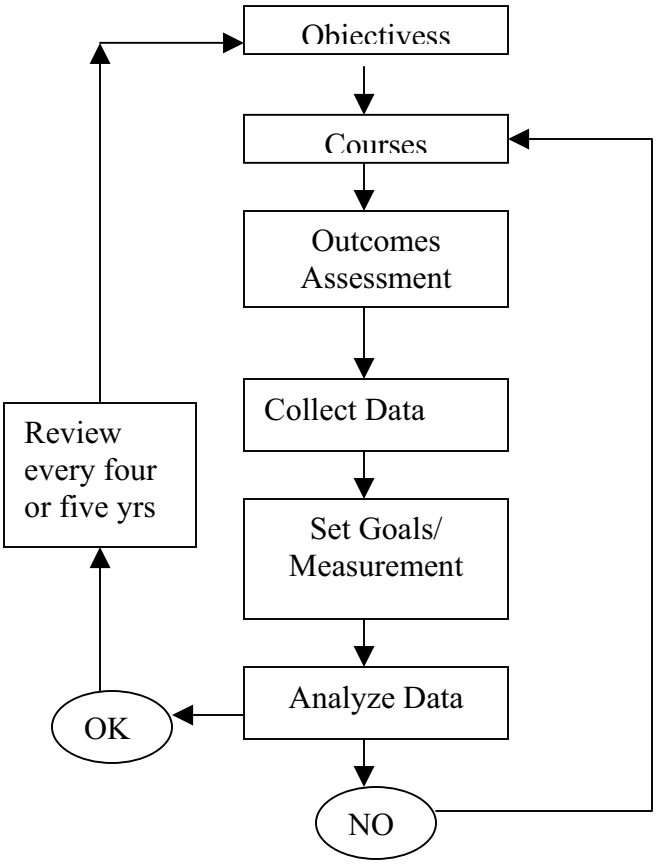
Weak Features

1. Program outcomes do not satisfy ABET criteria b, d, g, j, and h not clear
2. Specific criteria to the program not considered i.e. advanced math
3. Criteria f and j are limited only to design activity

Exercise 3
Critiques

1. Not enough assessment methods were adopted.
2. The survey period of 4-6 years was too long.
3. No assessment methods related to examinations were used.

A Plan for Assessment and Evaluation of Program Outcomes
Step 1



Facilitator: Rutherford

Exercise 4
Step 2
Program Outcomes 1b

1. Use performance appraisal and oral examination to assess presentation skills rather than technical content e.g. assigning an individual course project or writing a laboratory report with group presentation.

Program Outcome 2b

1. Same as 1b except that a group project is assigned that includes social impact criterion

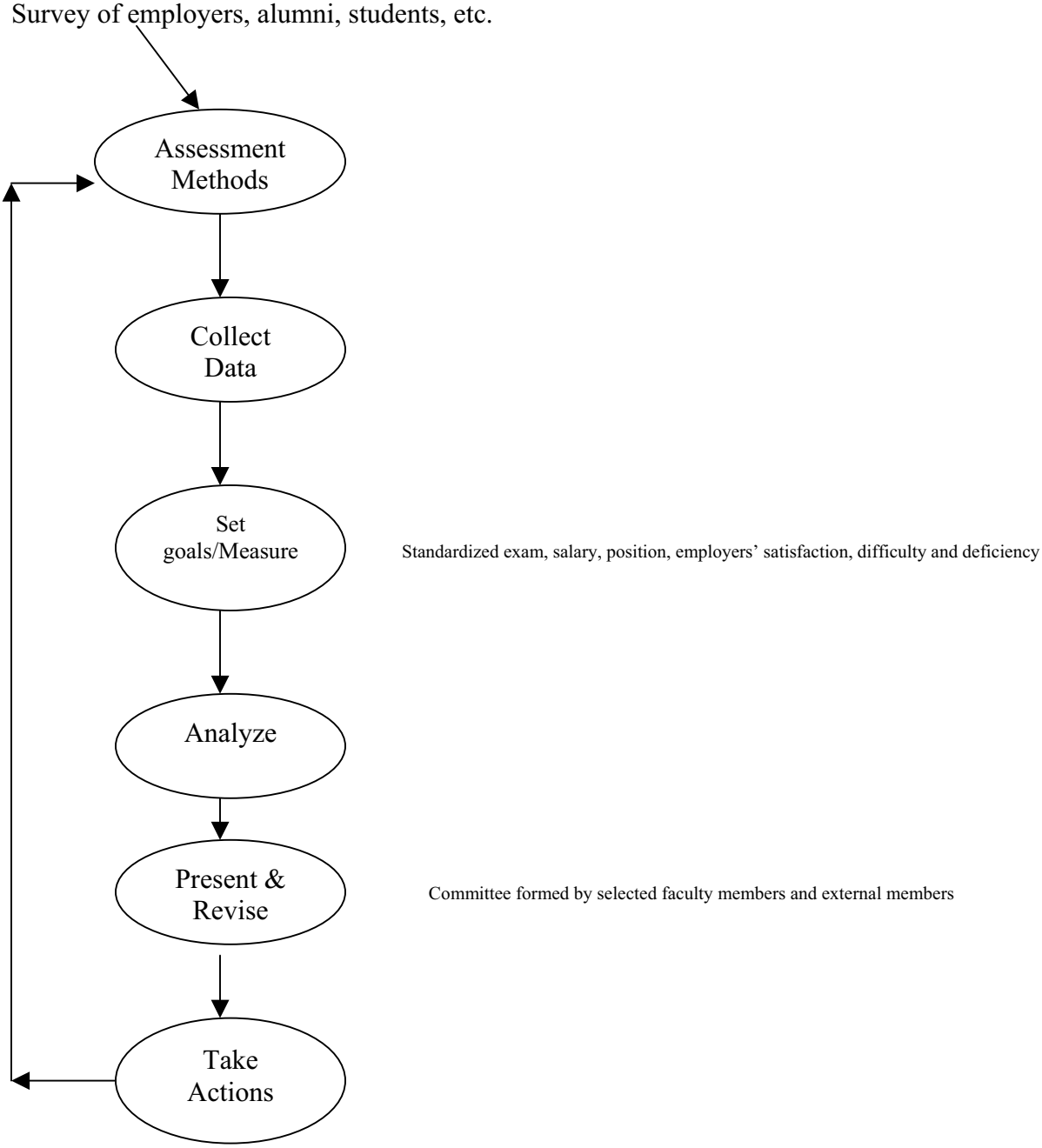
Frequency: each time the course is offered

Measurement: minimum of B as course grade

Facilitator: Rutherford

Model Plan

Survey of employers, alumni, students, etc.



Facilitator: Rutherford

Education Objectives

Produce highly sought after graduates who:

1. Responsibly practice mechanical engineering in the areas of manufacturing, machine tools, mechatronics and energy conversion processes
2. Are adept in applying modern engineering tools in practice
3. Are capable of conducting applied research relevant to the needs of the province
4. Are well-prepared to tackle graduate studies
5. Are professionally and ethically responsible to provide leadership in business and industry.

Objective 1
Survey of alumni and employers

Objective 2
Survey of alumni & employers focus group (alumni, industry and faculty)

Objective 3
Survey alumni and graduate school

Objective 4
Survey of graduate school and archival records

Objective 5
Survey focus group

Facilitator: Anderson

Points of Learning:

- How to identity Objects & Outcomes
- How to select Assessment Tools
- Objectives & Outcomes must be consistent with University Missions
- Iterative process
- Establish Benchmark can be difficult
- Strategic planning for implementation
- Need to educate every party who will be participating (stakeholder)
- Concise statements
- Continuous Quality Improvement (CQI)

Table A

Assessment Evaluation of Performance Outcome

1. Uninterrupted define project addressing a broad spectrum of issues covered in the curriculum
2. Students submit report and make presentation.
3. Adopt oral exam approach under (Assessment method)
4. Addressing various counterparts in the curriculum
5. Summarize the areas redefining improvement
6. Feedback to faculty yearly for improvement.

1. Assess the ability of graduates for application of knowledge through (1) and (9)
   a. 1: written surveys and questionnaire
   b. Performance appraisal
2. Frequency I survey will be once a year
3. Survey will be conducted through employers to determine the capability of graduates of applying the knowledge to solve real world problems
4. Collate, review and take relevant action for improvement of the program and institutional practice.

Objective 1: produce graduates who can function effectively as electrical engineers…

Attributes of education objectives

Specifies technical competence desired
Identifies personal characteristics of graduates
Addresses employer expectations
States the role expected from graduates in the industry
States the challenges to be met in the working environment

Outcome Exercise
Step 2

1. Explicitly states the nature of knowledge and skills that a person can possess

Facilitator: Anderson

2. Express what needs to be demonstrated
3. Supportive of educational objectives
4. Do no include measurable expectation.

Educational Objective -1
Graduates from Civil Engineering @ TPU will have broad based knowledge to solve civil engineering problems with modern tools and to communicate effectively in a multidisciplinary environment.

Educational Objective -2
Graduates in Civil Engineering @TPU will be able to operate successfully in both research, business and industrial environment, and meet the development needs of the province.

Educational Objective-3
Graduates from Civil Engineering @ TPU will function ethically in their professional and social responsibilities.

Evaluation * Examples of questions
Able to handle hard-core engineering problems?
Able to apply engineering knowledge?
Able to work in a team & communicate effectively?
Able to integrate problems involving different disciplines?
Able to do creative work?
Able to carry out research work effectively?
Adaptability, flexibility and advancement in the business world?
Discharge duty diligently within the ethnical framework of the profession?

Program Outcomes:
Graduates of the
Civil Engineering program of TPU will:
Be able to use modern engineering tools effectively for component design as part of a team and communicate results effectively.

Obj-1
Program Outcomes
Have the broad education necessary to understand the impact of engineering solution in a global & societal context
Recognize the need for & the ability to engage in life-long learning

Obj-2
Program Outcomes
Able to understand their professional & ethnical responsibilities

Obj-3 Evaluation

Facilitator: Anderson

What is measured?
Component design as a team
What data will be collected?
Level of completion
Usage of tools effectively
Working as a team
Who will be involved in the assessment?
Faculty
External practice. Engineer

Who will be responsible for what?
Faculty: for task design, supervision, and evaluation of preliminary report.
External engineer: for final evaluation @ advisory capacity
What analysis will be done on collected data?
Identify common strength & weaknesses
Compare to established benchmark

What actions or changes will result from data analysis?
Recommendation for corrective actions...

Table B

Name of program: BSc (CE)
Objectives: to produce graduates who:

- Practice major areas of CE and serve the needs of industry and government organizations
- Support the economic development of the province

Assessment and Evaluation Plan

1. Written survey
   a. Employment survey yearly
   b. Employer survey yearly

2. Interview
   a. Alumni in groups
   b. Leading firms/government organizations

3. Data collecting analysis and evaluation improvement (every 3 years)

Outcomes
Each graduate will demonstrate by graduation
Have knowledge/skills in basic sciences & engineering for infrastructure development
Ability to design & solve problems for infrastructure projects

Assessment

Facilitator: Anderson

Internal examinations (individual)
Simulated design projects internal and eternal assessors (team)

Attributes of Well-stated Program Education Objectives
Achievable, measurable, relevant, consistent with mission of institution, and clearly defined

Attributes of Well Stated Program Outcomes
Clear & precise, measurable, achievable, in line with education objectives, relevant, satisfies criterion 3 (a-k), and satisfies program criteria

Exercise 3
Objective 2
Teamwork (i)
Ethical conduct (ii)
Communicate effectively (iii)

Assessment tools of written survey and performance appraisals

What to measure? Level of competency in (i) – (iii) and satisfaction from employers

Cycle time lines
Present status of program adjust and 1 year before next assessment.

Exercise 4
Objective 2
Outcome 2A: communication skill

Assessment tools:
Performance appraisal (capstone project)
Exit survey/interview

Rationale:
Assessment by faculty and industry/professional
End of program feedback

Frequency: yearly (faculty meeting to discuss finding and adjustment to program)

Facilitator: Briedis

Points of Learning

1. Lots of work so must be efficient
2. Systematic method
3. Must make case for your circumstance
4. Understanding of terminology
5. Word choice is important
6. Must be on going to be successful
7. Requires team work for faculty/requiring a team leader
8. College needs to play a coordinating supporting role (not every department needs to reinvent the wheel)
9. Measurable/realistic/specific/concise/challenging but achievable

Table B

Outcomes	***Obj/a-k***	***Assessment (frequency)***
Apply knowledge of basic science & engineering into chem. Eng. field	7/A	L.E. (4) P.A. (5) D.E. (11)
Design chem. Eng. (units, equipment, processes, plants)	7/B,c,e,h,k	P.E. (4) E.E. (10) D.E. (11)
Conduct experiments, analyze, & interpret data	3/b,c,e,h	L.E (4) E.E. (10) D.E. (11)
Communicate effectively	5/g	(2,11,8)
Function on multi-disciplinary teams	5/d	(12)
Understand professional & ethical responsibility	4/f	(8,12)
Understand the impact of chem. Eng. industry on environmental issues and society	1,2,4/h	(11,12)
Learn independently	3/I	(4)
Interface with other professions related to chem. Eng industry	5/d,g,h	(1,2)

Model plan for Assessment Evaluation of Outcomes

Outcome 1A

2 Direct assessment methods: portfolio & perf appraisals

Monitor and diagnose weak points in student' performance

Faculty & constituencies analyze focus groups and decide what to do for further improvements

Outcome 2A

2 direct assessment methods: simulations and oral exams

Facilitator: Briedis

Attributes List

1. Descriptive program
2. Meet the requirements from the feedback on the constituents with the mission statement the institute
3. Objectives should be clear & concise
4. Objective should be measurable
5. On going efforts
6. Challenging & achievable

Objectives Critique

1. No systematic plans & steps
2. Insufficient assessment methods (numbers)
3. Allocation of duties not specified
4. Feedback only restricted from constituents. Need to benchmark from other institution.
5. Data collection should be summative & formative

PEO's

1. Have graducates who will be applying knowledge, skills and problem solving ability in serving the continual industrial development of the providence and government
2. Have engineers with a capability to conduct basic and applied research to improve the socioeconomic status of the country
3. Have engineers with a strong belief in professionalism and ethics in line with the institutional foundation principles
4. To instill the desire to keep abreast in a rapidly changing world

Program Outcomes

Adopted a-k

PO	**1**	**2**	**3**	**4**
A	X	X		
B	X	X		
C	X	X		
D	X			
E	X	X		
F			X	
G		X		
H				X
I				X
J				X
K	X		X	

Facilitator: Briedis

PEO	Measurable Variable	Assessment Tools	Frequency
1	Employment status PE license # of promotion	Survey (Alumni, employer) Survey FE exam result survey Focus Group	2 years 2 years 2 years adhoc
2	# of patents # of res. Articles # of conf pres	Computer database “ “ Focus Groups	2 years 2 years 2 years adhoc

PO	Measurable Variable	Assessment Tools
C	Mark for CD Mark for design component in FYP Mark in design course (machine, creative decisions an design) Design competition (U/R/I)	Archival record, portfolio, course file Exit survey & interview, employer survey
F	Mark in engineering ethics course utilization of engineering codes & standards Violation of university code of ethics	Archival records, course file Exit survey & interview/Employers survey Archival record/exit survey

Table A

Sample Assessment of Objective
Entrepreneurship Survey
Q: how much commercialism have you done?
A: Focus groups - why so few graduates have been able to commercialism? And what can the university do to encourage commercialism?

Assessment of Outcome
Example: teamwork
Vehicle used – team projects

Means of assessment:

i. Behavioral observation how team deals with problems
ii. Oral examination posing questions to individual team members to ascertain awareness of roles
iii. Through use of forms – sample questions:
   - ❖ How were roles determined?

Facilitator: Briedis

- Assessing peers – did everyone play their role?
- How were problems resolved?
- How were conflicts dealt with?
- What was the percentage of your contribution?
- How did your team handle slackers (if any)?

Assessment of Outcomes
Example of teamwork method

1. Performance appraisal/oral exam
2. Behavior observation

1. Assessment sheet
   a. How work was divided?
   b. What kind of roles you played?
   c. How to solve problems with interface & integration?
   d. How to deal with conflict?
   e. What is the percentage of your contribution?
   f. How is your team dealing with slacker, problem member?

To graduate students who are able to:

- Apply the principles & methods of electrical, electronic, & computer engineering, in particular to analyze, design, & implement devices & systems under the contrints of resources with overall future sustainability
- Who are able to work in teams as well as be leaders & entrepreneurs within the provice & nation

Program Outcomes:

	1	2
A	X	
B	X	
C	X	
D		X
E	X	
F	X	X
G	X	X
H		X
I	X	
J		X
K	X	
L		X

New: L = to be aware of the issues in commercialization of products & ideas

Facilitator: Briedis

Assessment of Objectives
Methods used

a. Surveys of alumni and employers (3 –4 years out)
b. Focus groups of alumni and employers with faculty members as facilitators

Objectives to be assessed

a. Leadership
b. Entrepreneurship

Strong Features

1. Address some constituencies need
2. Faculty's strong commitment
3. Faculty collaboration with local industry
4. Develop leadership & responsibility
5. Strong emphasize on fundamental knowledge & skills

Weak Features

1. No mission statement
2. No feedback system from constituencies
3. Some constituencies not consulted
4. Objectives are general in nature
5. Too many objectives
6. Communication skills are not included
7. Not focus on early year after graduation

Attributes List
The objectives:

1. Should be specific & focused to discipline
2. Must address the need of constituencies
3. Must be achievable
4. Must align with the mission of institute
5. Must be measurable & quantifiable
6. Statement must be clear and concise
7. Limit the number of statement

Facilitator: Elifrits

Points of Learning

1. Definition of terms (objectives, outcomes, assessment tools)
2. Difference between objectives and outcomes; relationships
3. Details of assessment methods
4. Scope of the process is large lots of work
5. Learn the difficulty of reaching consensus – international

Table A

Mission is to support the economic develop of the province by providing education and research progress that are responsive to the needs of industrial and government organizations and the needs of individual citizens.

Objectives:

- ❖ Produce graduates who practice as well as conduct research in the following civil engineering areas; transportation engineering, structure engineering, geo technical, environmental, and water resources.
- ❖ Produce graduates who are able to respond to the needs of industry and contribute to the provincial economic development.

Program Outcomes

1. Ability to complete a comprehensive problem in one of the application areas incorporating the realistic constraints that include most of the following considerations: transportation eng, structure eng, geo technical, environmental, and water resources.
2. An understanding of how business operates and knowledge of laws related to civil engineering.
3. An ability to work and communicate effectively.

Strong Features	**Weak Features**
#1 Include expectations of all constituencies (e.g. administers, faculties, and parents)	#1 Not provide levels of achievement
#2 Include the role of leadership as well as technical proficiency	#2 No description of action Should not limit to only the role of engineering
#3 Emphasize the mission of this school to cultivate students to be the leaders for the country (should be a top level univ)	#3 Can be a bit more ambitious (e.g. areas of government) Describe mainly on the environment rather than the ability of students
#4 & #5 Include both technical & non-technical components	#4 & #5 Lack of professional dimension of success Too wishful thinking at this stage

Facilitator: Elifrits

Faculty - Strong
1. Link industrial expert with academia
2. Develop mentoring process between faculty and student interaction

Faculty – Weak
1. Lack of pedagogical skills
2. Not ambitious enough
3. Need to develop evaluation method

Objective	**Tool**	**What will be measured?**	**What data?**	**Involved? Responsible?**	**How often?**	**What analysis?**	**Actions?**
#1 Produce graduates who practice as well& conduct research in the following civil eng areas	Surveys	Achievement levels	Tasks, projects, awards, professional cert	Employers graduates for providing data Faculty for design of surveys & evaluation of data	Every 4 years	Statistical Quality Quantitative Reliability Validity Correlation Performance indicators # of awards obtained # of projects completed on time # of levels of certified graduates	Do results meet expectations? Yes Enhancements? No What to change? How to change? Timeline? Resources? Publish data of records results.
#3 Able to work & communicate effectively	Oral exam Checklists Rating scale	Confidence Ability to express clearly Right terminology Appearance	Presentation style and contents Use of presentation techniques	Students Faculty Industry Provide peer assessment and design of checklist of rating scale External examiner	Junior Senior	Statistical Qualitative Quantitative Performance indication Marks of students (e.g. grades, comments)	Do results meet expectations Yes Enhancement No What to change? How to change? Timeline? Resources?

Facilitator: Elfirits

Table B

Program Educational Objectives (civil engineering)

1. Produce civil engineering graduates who con effectively work as practing engineers in the private and public sectors.

Tools:

a. Written/surveys and questionnaires
b. Locally developed examinations
c. Simulations

Processes:

Time frame and responsibility – what to measure? Data? Survey to whom?

Evaluations: analysis and action

2. Prepare civil engineering graduates who can effectively take on basic and applied research

Tools:

a. Written surveys and questionnaires
b. Portfolios
c. Behavioral observations

Strong Features

1. Based on survey & analysis of the constituents
2. Address to needs of constituents
3. Skills to diagnose problems
4. Some objectives need to have more detail

Weak Features

1. Some objectives are too broad
2. Development after graduation is not school's responsibility
3. How to define become leader's
4. Neglect some constituents

Program Outcomes (civil engineering)

One:

1A

Achieve in the capstone design course the following skills: use of design standards at specifications; apply constraints that may include economic, environmental, sustainability, ethical, constructability, health at safety, social, and political considerations. (Portfolios, simulations)

Facilitator: Elifrits

1B
Graduates will gain the necessary skills to communicate effectively (oral, written, portfolios)

1C
Be able to work on multidisciplinary teams (behavioral observations and simulations)

1D
Be able to conduct experiments and analyze data (portfolios)

Two:

2A
Be able to apply knowledge of math and science in civil engineering (locally developed examinations, portfolios)

2B
Gain the broad education necessary to understand the impact of engineering solution in a global context. (Portfolio)

2C
Aware of contemporary issues and their impact on engineering technologies (simulations, oral exams, portfolios)

Facilitator: Elfirits

Objective	Tools	What is measured?	Data	Involved	Responsible	How often?	What analysis?	Actions?
1	2 Loudly develop exams	Knowledge skills	Numbers	Practicing engineers	Faculty Eng. Society Industry	Once a year	Statistics Acceptable rate or threshold (target)	Choice Yes No Corrective action
1	1A	Portfolios	Knowledge skills	Number	Senior students	Faculty		

Attributes of Well Stated Program Objectives

1. Should be based on constituencies needs
2. Should be consistent with the mission of the institution
3. Should be measurable
4. Should have realistic expectations
5. Should be focused but not limited
6. Should address personal, professional, and technical development

Program Outcomes

Strong

1. Flexibility (e.g. any of the three application areas)

Weak

1. Verbs should be more clear
2. Did not mention the knowledge of math & science
3. No indication of how they do that with individual or teams
4. Commitment is immeasurable
5. Too complex
    a. Practical problem
    b. Delete the word complex
    c. Add the verb identify in #2

Facilitator: Elfirits

6. Did not mention the skill of communication

Attributes of Well Stated Program Outcomes

1. Program outcomes should be verifiable.
2. Program outcomes should be realistic.
3. Program outcomes should address technical and professional skills as continued in the criteria.

What Tools?	**What will be measured?**	**What data?**	**Who will be involved?**	**Who will be responsible?**	**How often?**
1. Archival records 2. Survey 3. External examiner 4. Portfolio	Mission Needs of constituents How will the objectives be achieved Provide unbiased opinion Ongoing progress of students	Alumni opinion regards to quality of program's graduates	Faculty Constituents Parents Assessment staff University advisory board Chairman	Assessment of data Interpret the data modify the curriculum if necessary	Analysis of trends and progress and then provide recommendation

Objective 1
Outcome 1A
Direct: Simulation, oral exam
Indirect: Portfolio, external examiner

Objective 2
Outcome 2B
Indirect: locally developed exam; simulation (scenario)
Direct: performance appraisal

Facilitator: Elfirits

Our suggestion of the new set of evaluation

1. Archival records

To find out the mission and the process that ensures the achievement of objectives

2. Survey

To find out the needs of constituents
To find out how well the objectives have achieved

3. External evaluation

To provide unbiased opinions

Suggestions

1. We suggest that to use more than one assessment tool to evaluate the program
2. We suggest to have some reporting processes yearly
3. We suggest to implement tools other than survey (e.g. archival records, external examiners, and portfolio to provide on going evaluation)

Exercise 1

Attributes of Well-stated Educational Objectives
Specific objectives that takes into consideration the needs of the constituents
Objectives that meet the mission of the university and the college
Measured objectives
Must be publishable
Objectives that meet part of the strategic plan of the department

Educational Objectives
Strong Features

- Based on surveys of constituents
- Some objectives address the needs of the constituents

Weak Features

- No mission (university, college)
- Some objectives are not needed
- Broad objectives
- Non-measurable objectives
- Wishful objectives

Exercise 2

Strong Features
First three outcomes are good and attainable
First three outcomes support educational objectives (at least some)

Weak Features
Last three outcomes are weak (wording…)
No mention of: multidisciplinary work, communication skills, knowledge of contemporary issues, and design at conduct experiment

Facilitator: Elfirits

Attributes of Well-stated Program Outcomes

- Outcome that support the stated objectives
- Outcomes that can be measured and taught in curriculum
- Attainable outcomes

A Plan for the Assessment & Evaluation of Program Outcomes

Program Outcome 1A: simulation, oral examination portfolio
Program Outcome 2A: portfolios, performance appraisal, oral examinations

A Plan for the Assessment Evaluation of Education Objectives

Targeted the constituents by indirect assessment tools (Survey)

Critique:

Survey details are not available (e.g. how many surveys # of feedback, the content of survey, the follow up for response)

No use of other direct assessment tools

Timeline is long (better less then 4 yrs.)

Participants Develop a Model Plan for Objective 1

Tools needed: written survey & questionnaires, performance appraisal, commercial, norm-referenced, standardized, examinations, and external examiner

Participants Develop a Model Plan for Objective 2

Tools needed: exit & other interviews, portfolios, simulations, performance appraisal, and oral examination

ABET International Faculty Workshop

December 9-11, 2003
National University of Singapore

What is ABET?

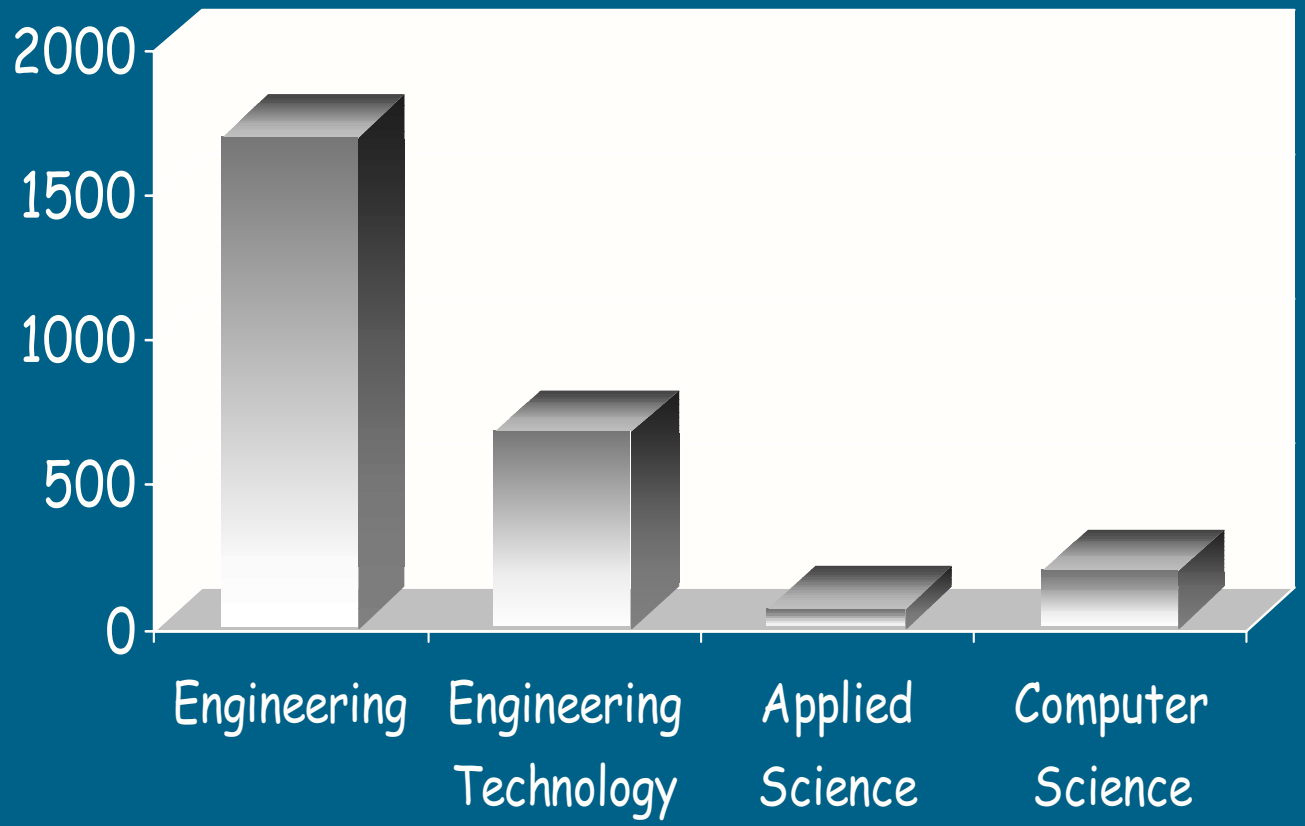
Established in 1932 as the Engineers Council for Professional Development (ECPD)

- to unite the engineering & technical professions through the professional engineering societies to assess quality
- by accrediting engineering, engineering technology, applied science, and computer science programs
- has grown to become a federation of 32 professional societies

The ABET Vision

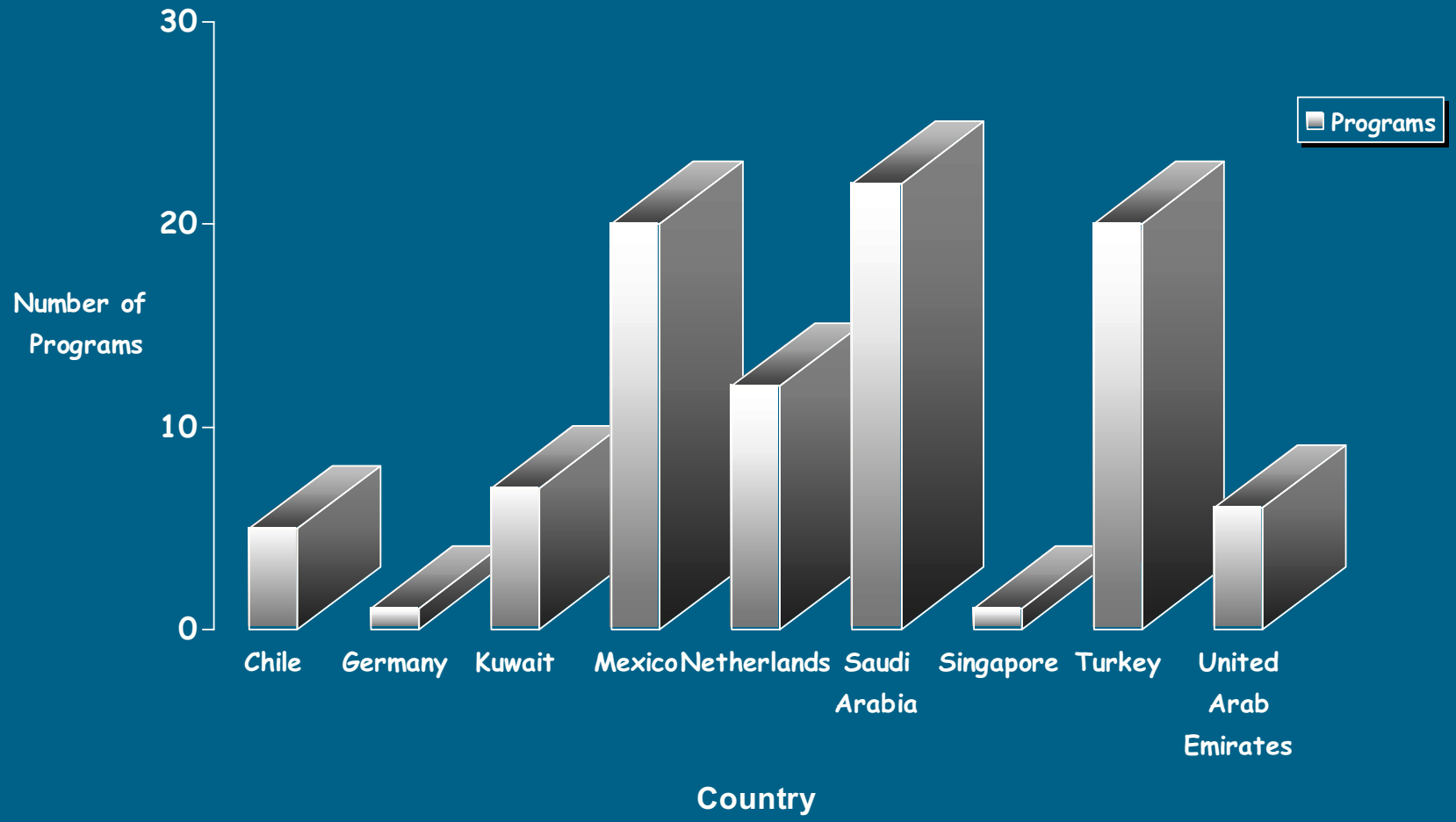
" Provide world leadership to assure quality and stimulate innovation in engineering, technology, computing, and applied science education."

US Accredited Programs



September 2003

Recognized International Programs



*ABET serves the public through the **promotion and advancement** of engineering, computing, technology and applied science education.*
ABET:

- Accredits educational programs.
- Promotes quality and innovation in education.
- Consults and assists in the development and advancement of education worldwide
- Communicates with constituencies and the public regarding activities and accomplishments.
- Anticipates and prepares for the changing environment and the future needs of constituencies.

The Vision for Change

The ABET PROCESS

"… a simple non-adversarial accreditation process grounded in the philosophy of continuous quality improvement, that is efficient and productive for all volunteers, and for institutions seeking accreditation."

1994

The Vision for Change

The ABET CRITERIA

"A revised criteria should maintain a strong focus on quality, and professional preparation, while offering flexibility for major innovations in curricular design and delivery methods, and be applicable to a diverse spectrum of institutional missions and goals."

1994

The Paradigm Shift

New Philosophy

- Institutions and Programs define mission and objectives to meet the needs of their constituents
- Practice continuous improvement using:
  - Input of Constituencies
  - Process focus
  - Outcomes and Assessment Linked to Objectives
- Programs demonstrate how criteria and program outcomes are being achieved

Engineering Criteria 2000

". . . Maintains a strong focus on quality and professional preparation, while offering flexibility for major innovations in curricular design and delivery; and accommodates a diverse spectrum of institutional missions and goals."

Engineering Criteria 2000

1. Students
2. Program Educational Objectives
3. Program Outcomes and Assessment
4. Professional Component
5. Faculty
6. Facilities
7. Institutional Support & Financial Resources
8. Program Criteria

Program Educational Objectives

- ***Detailed Educational Objectives that are consistent with the mission and the criteria***
- ***A Process, based on needs of constituencies, in which objectives are determined and evaluated***
- ***A Curriculum and Process that ensures the achievement of these objectives***
- ***A System of Ongoing Evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the program***

Program Outcomes

Engineering programs must demonstrate that their graduates have:

a. An ability to apply knowledge of mathematics, science and engineering appropriate to the discipline

b. An ability to design and conduct experiments, analyze and interpret data

c. An ability to design a system, component, or process to meet desired needs

Program Outcomes (continued)

Engineering programs must demonstrate that their graduates have:

d. An ability to function on multi-disciplinary teams

e. An ability to identify, formulate and solve engineering problems

f. An understanding of professional and ethical responsibility

Program Outcomes (continued)

Engineering programs must demonstrate that their graduates have:

g. ***An ability to communicate effectively***

h. ***The broad education necessary to understand the impact of engineering solutions in a societal context***

i. ***A recognition of the need for, and an ability to engage in life-long learning***

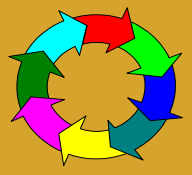
Program Outcomes (continued)

Engineering programs must demonstrate that their graduates have:

j. ***A knowledge of contemporary issues***

k. ***An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice***

EC2000 Implementation

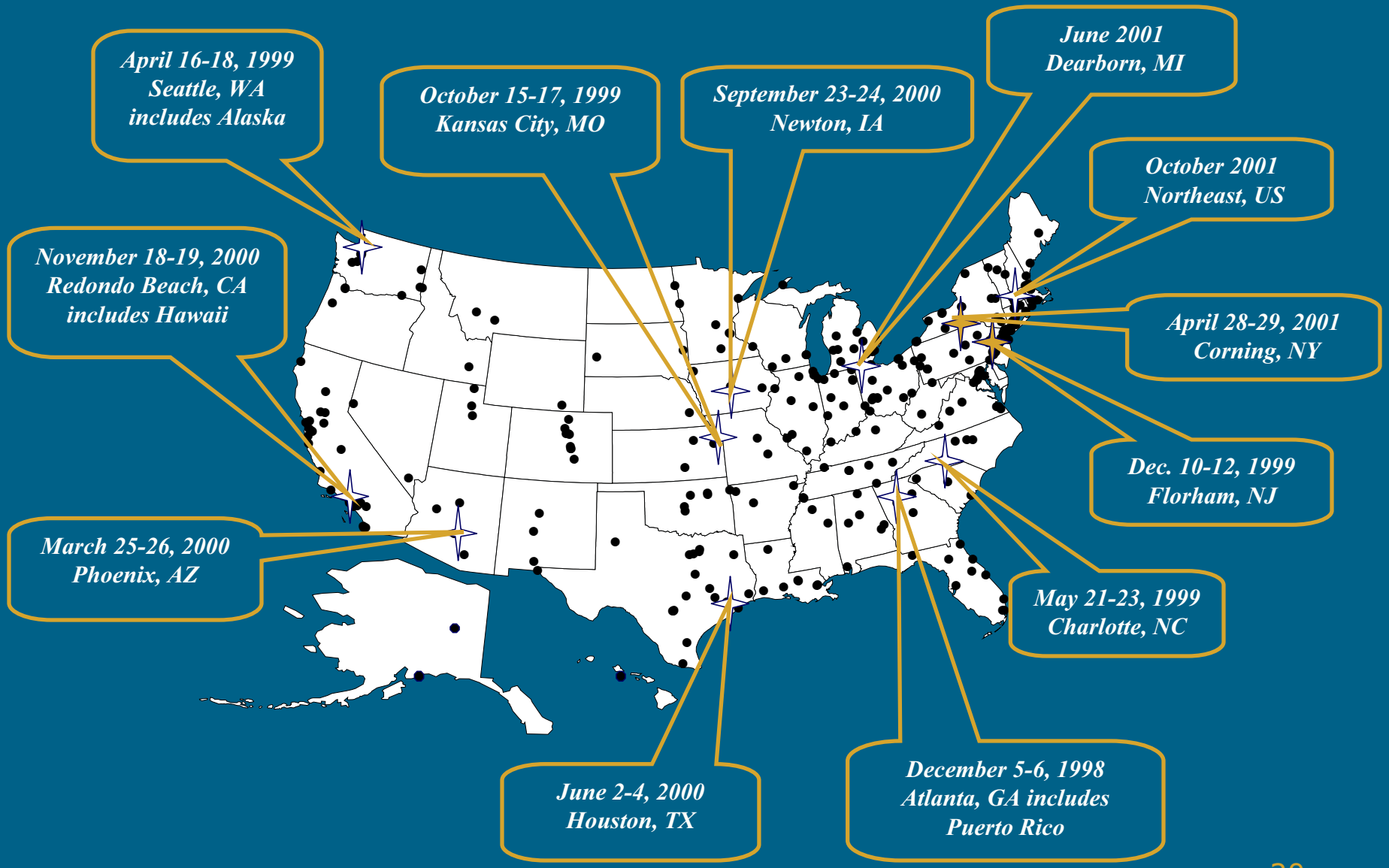
Evaluation Cycle	Type of Visit	All Eligible Institutions	% Institutions	Engineering Programs
1996	Pilot	----	----	14
1997	Pilot	----	----	16
1998	Optional	56	21%	54
1999	Optional	80	58%	249
2000	Optional	58	83%	270
2001	Required	51	100%	299
2002	Required	79	100%	331
2003	Required	63	100%	212
		Total	299	1415
		% All	91%	88%

The New Emphasis

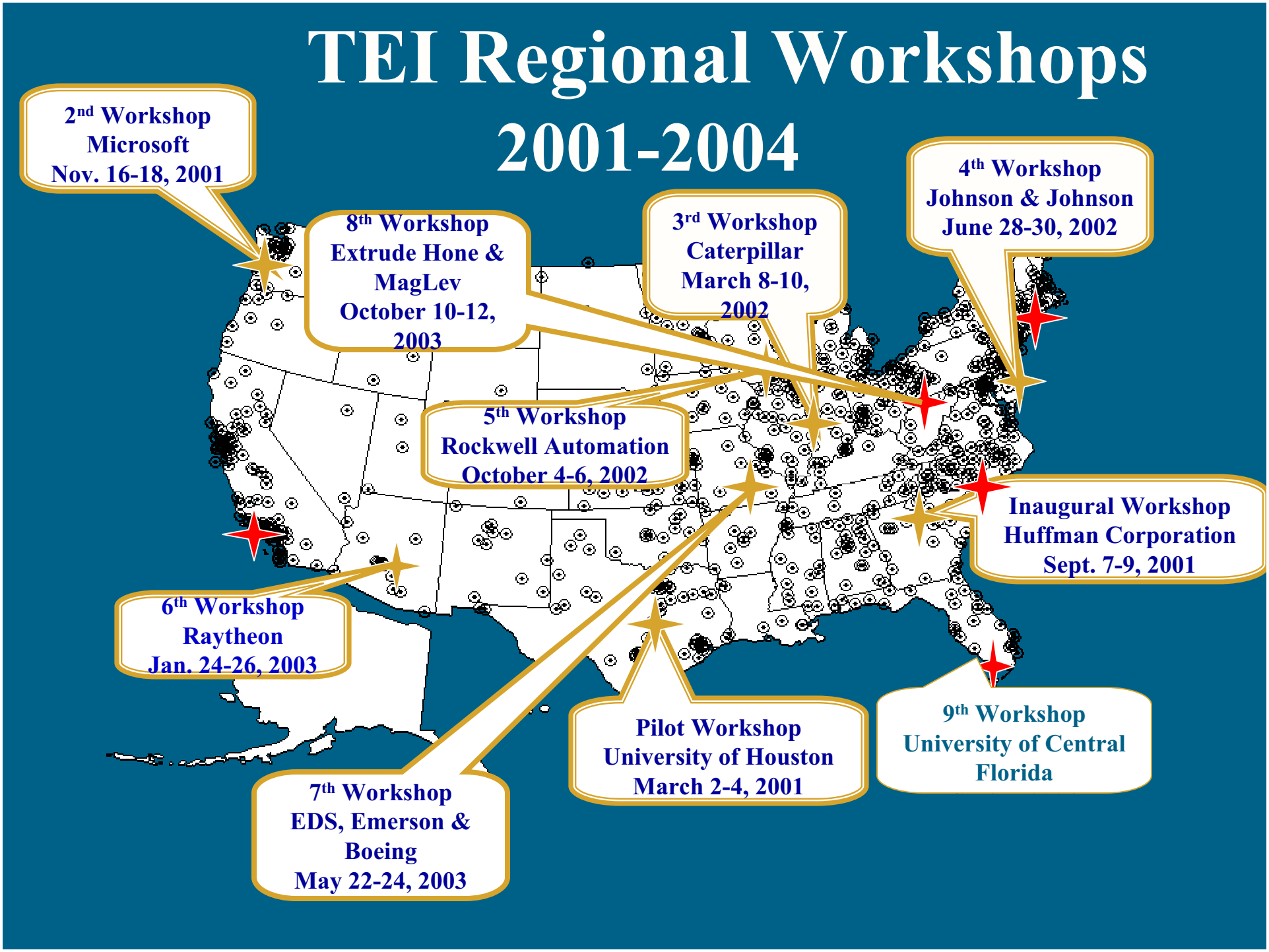
"I know my job
I do it well
I can prove it"

Libby Owens Ford
Glass Manufacturing Plant

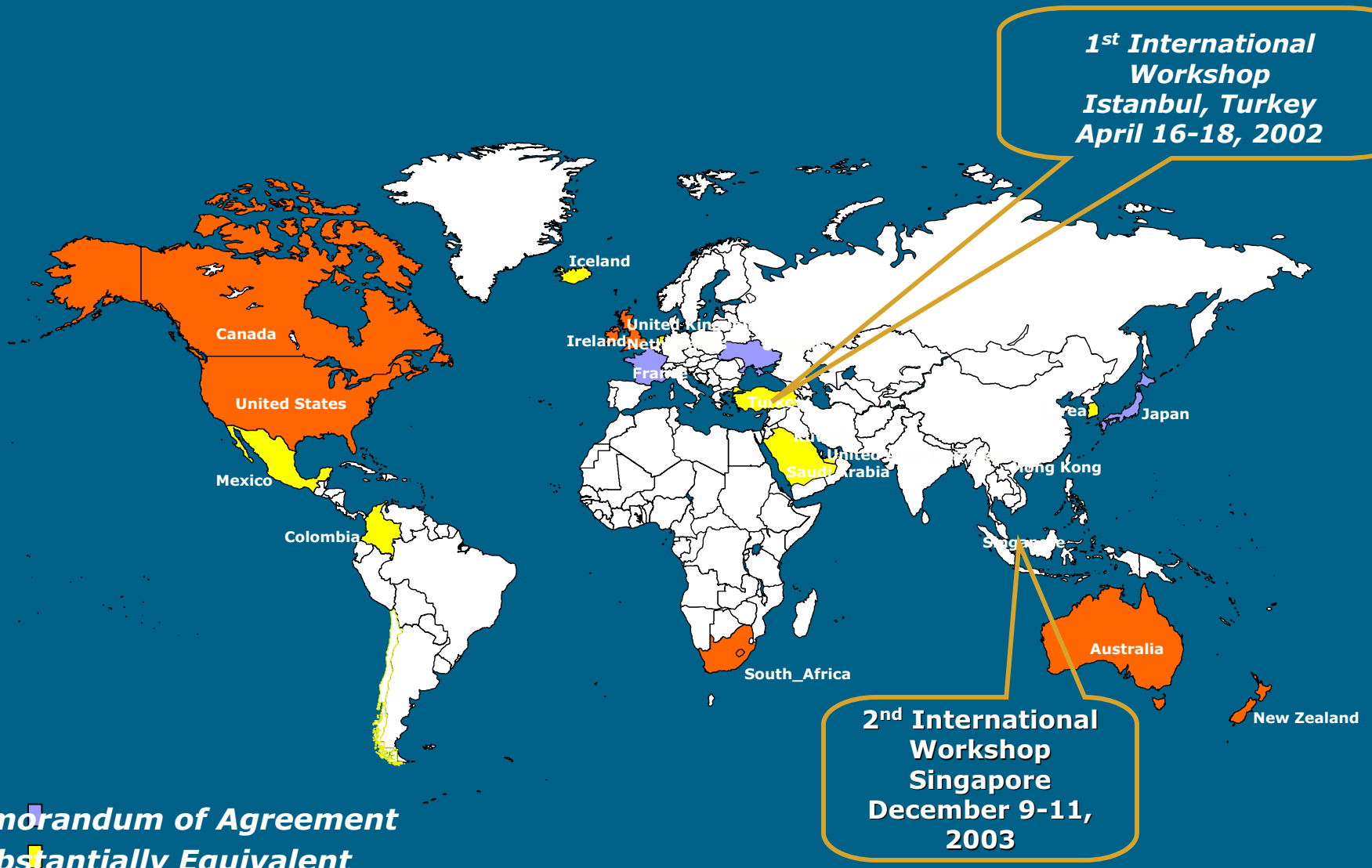
US Regional Faculty Workshops



TEI Regional Workshops 2001-2004



ABET International Presence



- We appreciate the invitation and support of the National University of Singapore and the collaboration and support of the Institution of Engineers and the Professional Engineers Board in furthering quality assurance in engineering education.
  - Thank You!

Fred W. Emshousen
Director, International Activities

Introductions

- **Maryanne Weiss**: Director, Education and Information Services, ABET Inc.
- **Gloria Rogers**: Vice President for Institutional Research, Planning, and Assessment, Rose-Hulman Institute of Technology
- **Richard Anderson**: Principal Engineer, Somat Engineering, Inc. and President-Elect of ABET Inc.

- **Daina Briedis**: Assoc. Professor of Chemical Engineering, Michigan State University and member of Board of Directors, ABET Inc.
- **David Holger**: Assoc. Dean of Engineering Administration, Iowa State University and Chair Elect-Engineering Accreditation Commission, ABET Inc.
- **John Rutherford**: Research & Engineering Specialist, The Boeing Company and member-Engineering Accreditation Commission, ABET Inc.

- **Gary Bubenzer**: Professor Emeritus, Biological Systems Engineering, University of Wisconsin, Past Commissioner-Engineering Accreditation Commission
- **John Steadman**: Dean of Engineering, University of South Alabama, Past Commissioner-Engineering Accreditation Commission and President, IEEE
- **Dale Elifrits**: Director of Pre-engineering and Outreach, University of Northern Kentucky and member, Board of Directors, ABET Inc.

A Very Special Welcome

- **Tay Guan Mong**: Senior Vice President of Artemis International Corporation Ltd.
- Mr. Mong, is an internationally recognized quality expert who will serve as consultant to participants throughout the workshop.

2nd International

Faculty Workshop for Continuous Program Improvement

December 9-11, 2003
Singapore

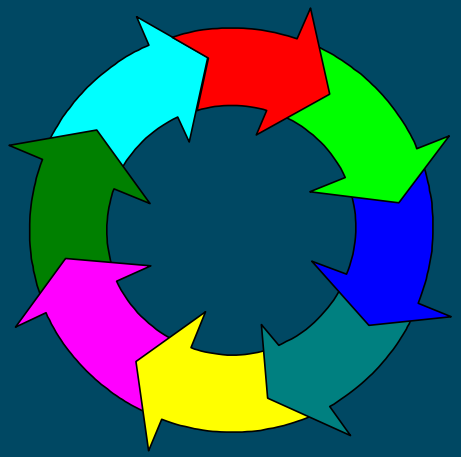
Continuous Program Improvement

Moderator:	Maryanne Weiss	
Facilitators:	Richard Anderson	David Holger
	Daina Briedis	Jack Rutherford
	Gary Bubenzer	John Steadman
	C. Dale Elifrits	
Assessment:	Gloria Rogers	
ABET INTAC Rep:	Fred Emshousen	

ABET Faculty Workshop

To Promote Continuous Quality Improvement in Engineering Education

The Paradigm Shift



Accreditation Reform

New Philosophy

- Institutions and Programs define mission and objectives to meet the needs of their constituents – enable program differentiation
- Emphasis on outcomes – preparation for professional practice
- Programs demonstrate how criteria and educational objectives are being met

New Emphasis

- Practice of continuous improvement
  - Input of Constituencies
  - Process focus
  - Outcomes and Assessment Linked to Objectives
- Knowledge required for entry into the profession
- Student, faculty, facilities, institutional support, and financial resource issues linked to Program Objectives

Goal of ABET

- To promote Continuous Quality Improvement in Applied and Computing Sciences, Engineering and Technology Education through faculty guidance and initiative.

Workshop Goals

1. Develop an awareness of learning-outcomes based program development.

2. Develop an awareness of the meaning and linkages among program educational objectives, program outcomes, assessment, evaluation, & constituencies.

Workshop Goals

3. Develop an awareness of a variety of assessment tools and their respective features, assets, utility, relevance and limitations.

4. Illustrate the structured & cyclic nature of planning, implementation, assessment, evaluation, feedback & change in a Continuous Quality Improvement environment.

Our Focus is !

- Effective Educational Objectives
- Effective Program Outcomes
- Practical Assessment Tools
- Effective Assessment Planning
- Robust Evaluation Planning

Workshop Format

- We are structured with both small group and plenary sessions
- We introduce concepts via critique of case study examples
- We apply concepts through group preparation of example scenarios
- We share results & develop understanding through interactive plenary sessions

Workshop Day 1

- Determine attributes of effective educational objectives & program outcomes
- Introduce a variety of assessment tools
- Determine key elements of effective assessment & evaluation plan for a learning-outcomes based program

Workshop Day 2

- Prepare set of program educational objectives for a specific discipline
- Develop assessment & evaluation plan for the program educational objectives
- Prepare a set of program outcomes for specific a discipline
- Develop assessment & evaluation plan for the set of program outcomes
- Summarize points of learning

Workshop Procedures

A. Record all your work
B. Identify recorded work by table and breakout room number
C. Reporting in Plenary Sessions:

   Each group selects a leader, recorder & reporter for each exercise
D. A workbook of all material & exercises will be sent to each participant

Criteria Definitions

Program Educational Objectives – statements describing expected accomplishments of graduates during the first years following graduation from the program.

Program Outcomes – statements describing what students are expected to know or be able to do by the time of graduation from the program.

Workshop Definitions

Assessment – processes that identify, collect, use and prepare data for evaluation of achievement of program outcomes or educational objectives.

Evaluation – processes for interpretation of data and evidence from assessment practices that a) determine the extent program outcomes or educational objectives are achieved or b) result in decisions & actions to improve program.

Continuous Quality Improvement

- A SYSTEMATIC PURSUIT OF EXCELLENCE
- AND SATISFACTION OF THE NEEDS OF CONSTITUENCIES
- IN A DYNAMIC AND COMPETITIVE ENVIRONMENT.

Continuous Quality Improvement

- CQI exists only when systematic & systemic
- CQI is the dynamic behavior of an organization
- CQI does NOT result from external factors
- CQI exists when the continuous pursuit of excellence motivates and guides the philosophies, planning, policies and processes of the organization
- CQI can NOT be achieved in isolation
- Focus of CQI in education is NOT on the curriculum

CQI Starts with Basic Questions

- Who are our constituencies?
- What services do we provide?
- Do constituencies understand our objectives?
- What services, facilities and policies must be present if we are to satisfy our constituencies?
- Do our suppliers and institutional leadership understand and support our needs?

More Questions

- What steps do we perform to provide our services?
- How do we measure our results?
- How do we use these results to continuously improve the services we provide?
- Are we achieving our objectives and improving?
- Are our constituencies satisfied?

Foundation of CQI is Assessment

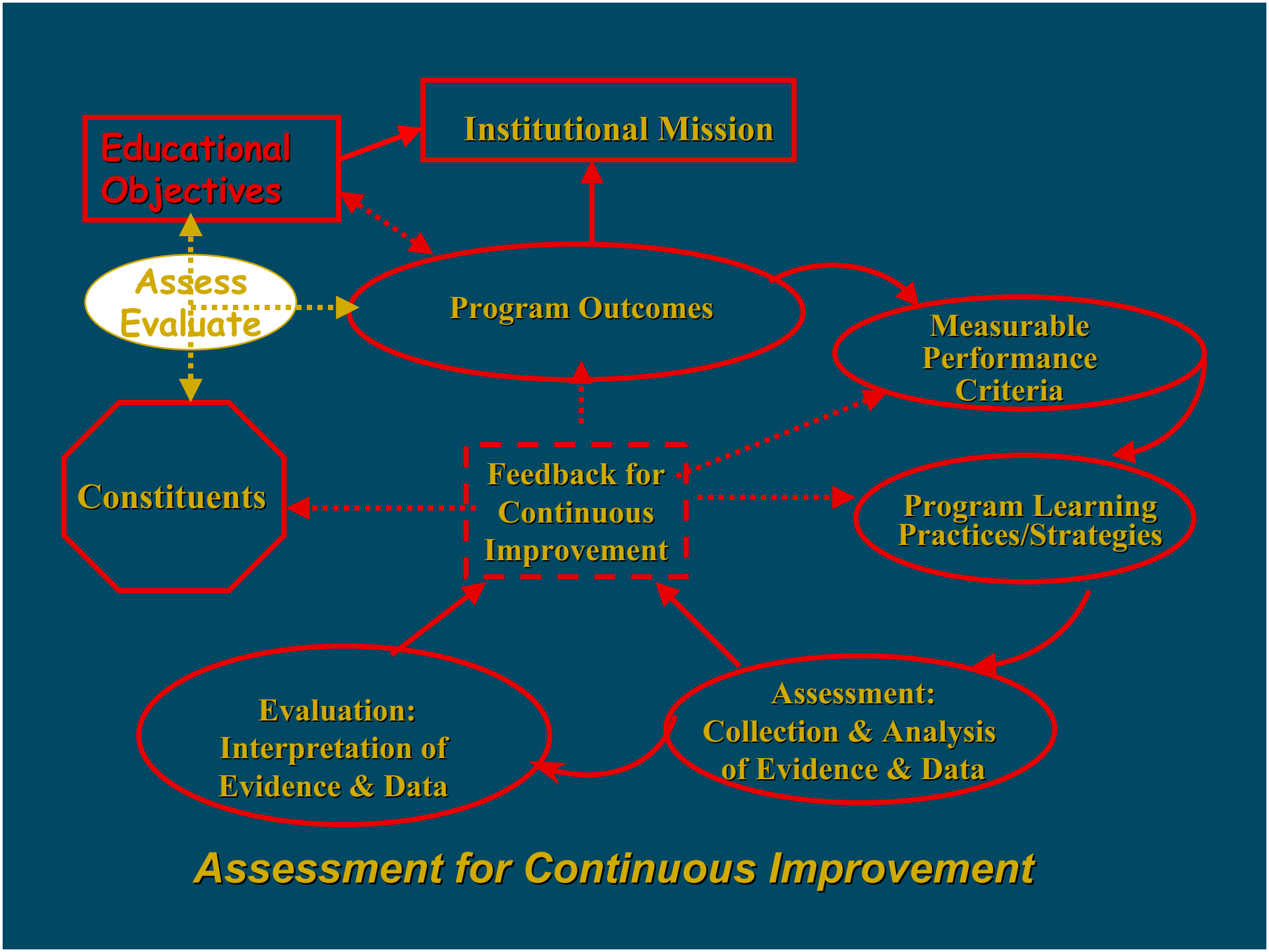
- Assessment of inputs & process only establishes the "capability" or "capacity" of a program
- Assessment of "outcomes" determines what is done with that capability
- Outcomes assessment improves:
  - Institutional effectiveness
  - Learning
  - Accountability

A Transformation in Philosophy

- Quality improvement comes from within institution
- Continuous improvement requires integration of defined objectives, performance metrics, & regular assessment
- Continuous improvement is cyclical - Assessment of performance is the baseline for future assessment
- Essential to synchronize educational objectives, mission of college and needs of constituencies to achieve CQI

Role of ABET Accreditation

The role of ABET accreditation is to provide periodic external assessment in support of the continuous quality improvement program of the institution.


Educational Objectives
Institutional Mission
Assess Evaluate
Program Outcomes
Measurable Performance Criteria
Constituents
Feedback for Continuous Improvement
Program Learning Practices/Strategies
Evaluation: Interpretation of Evidence & Data
Assessment: Collection & Analysis of Evidence & Data
Assessment for Continuous Improvement

"If you measure it, it will improve."

www.abet.org

Step 1: Who are your constituencies ?

- Identify possible constituencies?
- What are the expectations of each constituency?
- How will constituencies be satisfied?
- When will constituencies be satisfied?
- What relative priority do constituencies hold?
- How will constituencies be involved in your CQI?

Potential Constituencies

- Students, Parents, Employers, Faculty, Alumni
- Industry Advisors, Accreditation agencies
- Administration-Department, College
- Government-Local, State, Federal
- Transfer Colleges, Graduate programs
- Donors and contributors

Pick Your Constituencies

- Select no more than three constituencies to focus on for the workshop exercises
- Assign a person to represent each of these constituencies at each table
- Consider what influence selection of constituencies have on educational objectives

Objectives Summary

- Each addresses one or more needs of one or more constituencies
- Understandable by constituency addressed
- Number of statements should be limited
- Should not be simply restatement of outcomes

Outcomes Summary

- Each describes an area of knowledge and/or skills that a person can possess
- Should be stated such that a student can demonstrate before graduation
- Should be supportive of one or more Educational Objectives
- Do not have to include measures or performance expectations

Lessons Learned

- Start as soon as possible
- Develop a comprehensive plan
- Begin implementing the plan as quickly as possible
- Do not get bogged down in one of the early steps
- Close the loops as soon as possible

Lessons Learned

- Use consultants with caution - there can be positive and negative effects
- **Experience** with **outcomes assessment and continuous improvement** builds confidence for all constituencies

Lessons Learned

- Importance of defining terms
- When reporting to constituents or external evaluators, organize evidence by outcomes and objectives rather than by courses
- Evidence should show evaluation and assessment processes are in place and working

Lessons Learned

- Coordination between program assessment and institutional assessment is desirable
- Process descriptions should be accompanied with evidence of data reduction, analysis and recommended actions
- Use text to strengthen report, do not depend totally on tabular or statistical data

Lessons Learned

- Have unique Program Outcomes, total reliance on outcomes a-k usually indicates taking the "easy way out"
- Faculty from the most successful programs participated in training sessions and talked with faculty at other institutions
- Program Administration needs to be aware of (and supportive of) what programs are doing in continuous improvement

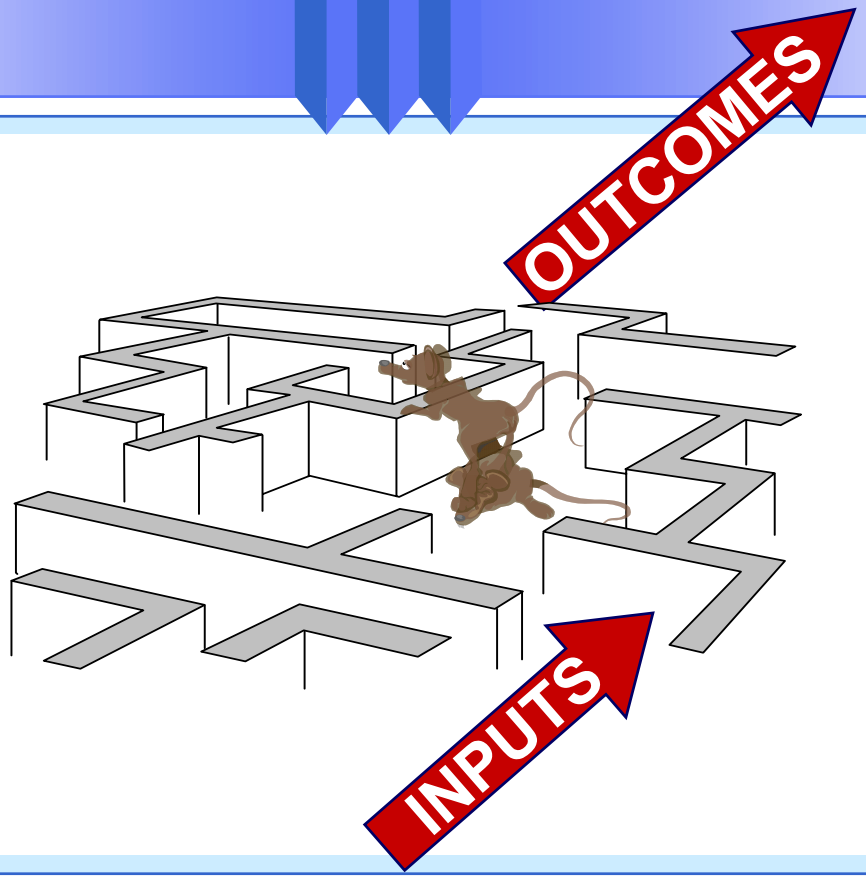
Lessons Learned

- Should not depend **only** on "long time constant" assessment tools
- Surveys should be only one of several evaluation and assessment tools used
- Tie requirements for faculty, facilities, etc. to objectives, outcomes and continuous improvement
- No apparent relationship between success and the size of the school

Lessons Learned

Successful Programs Have Two Common Characteristics When Implementing Continuous Improvement:

- one or more faculty members who are highly committed to developing and guiding implementation
- sincere involvement of the faculty members



2nd ABET International Faculty Workshop

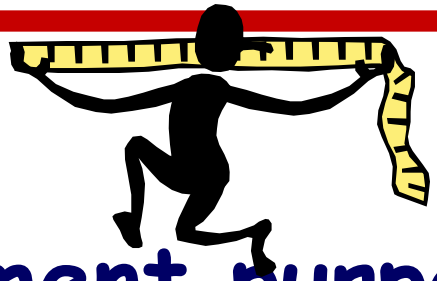
Introduction to Assessment Methods

Gloria Rogers

Singapore

December 9-11, 2003

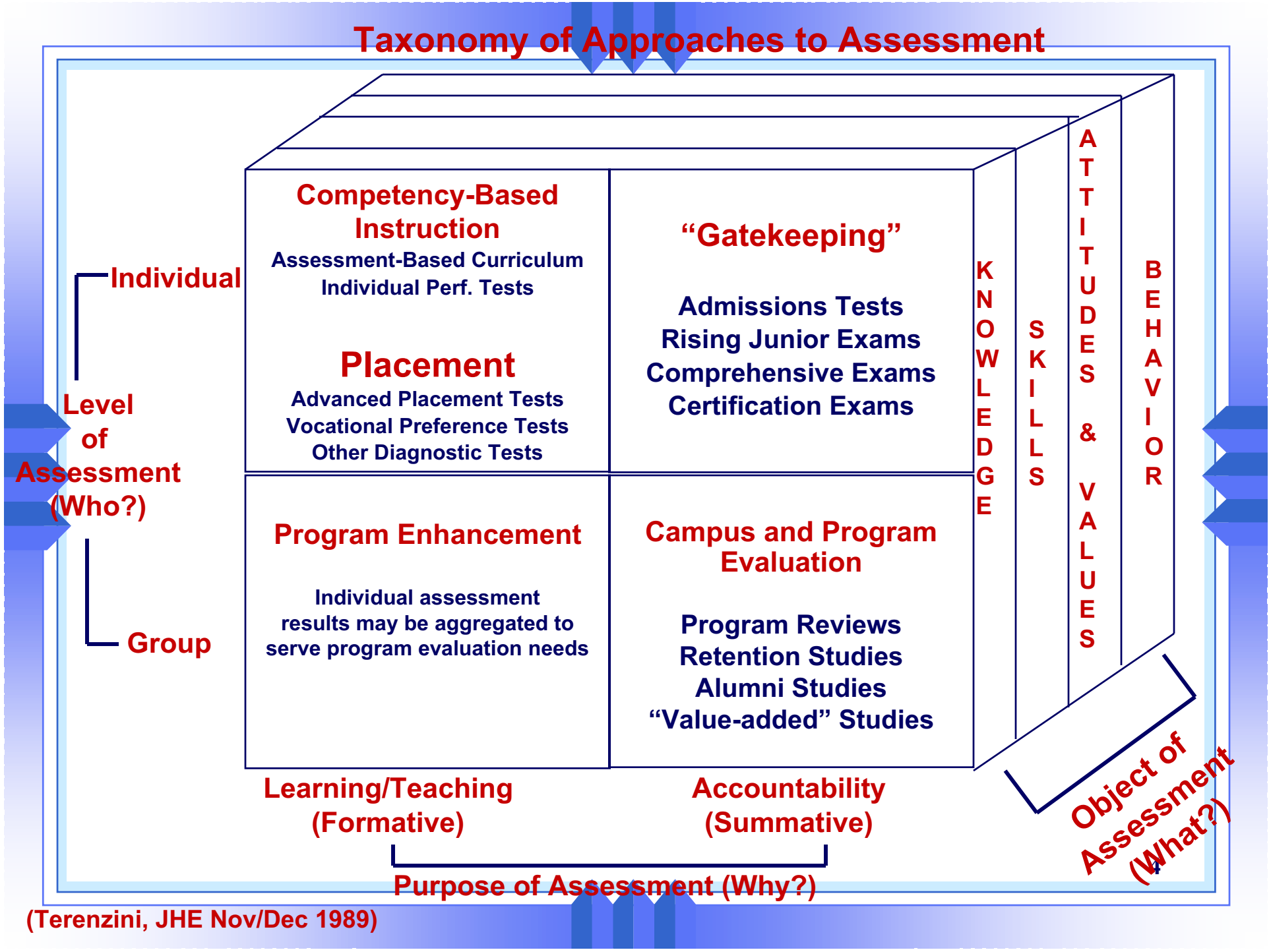
Assessment Basics: Overview



- ✓ Taxonomy of assessment purposes
- ✓ Characteristics of program outcomes
- ✓ Introduction to assessment tools
- ✓ Validity of methods
- ✓ Lessons learned

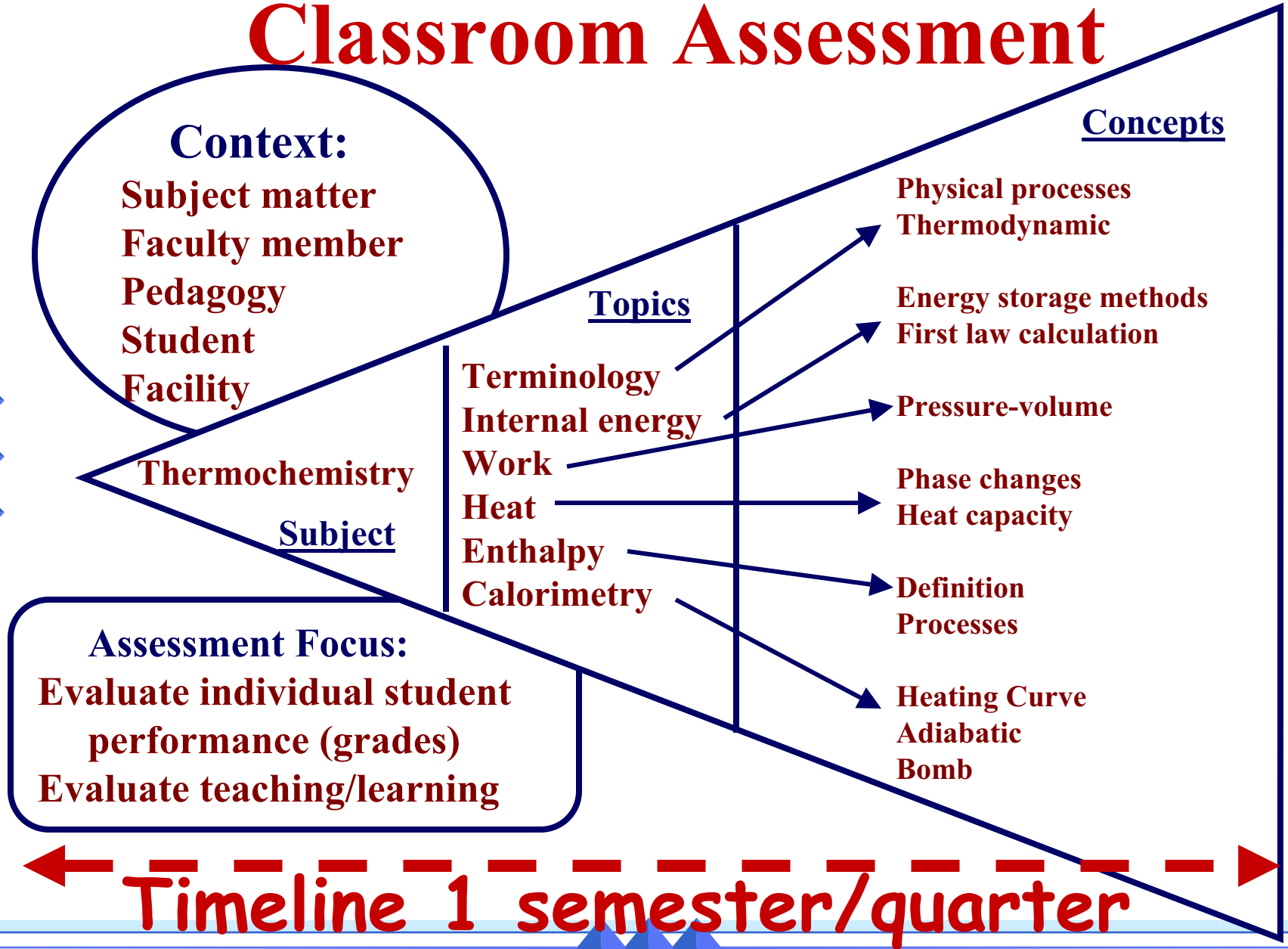
Terms	Definition	Some other terms for same concept
Objectives	Statements that describe the expected accomplishments of graduates during the first few years after graduation.	Goals, outcomes, etc.
Outcomes	Statements that describe what students are expected to know and able to do by the time of graduation.	Objectives, standards, etc.
Performance Criteria	Specific, measurable statements identifying the performance(s) required to meet the outcome; confirmable through evidence.	Standards, rubrics, specifications, metrics, outcomes, etc.
Assessment	Processes that identify, collect, use and prepare data that can be used to evaluate achievement.	Evaluation
Evaluation	Process of reviewing the results of data collection and analysis and making a determination of the value of findings and action to be taken.	Assessment

Taxonomy of Approaches to Assessment

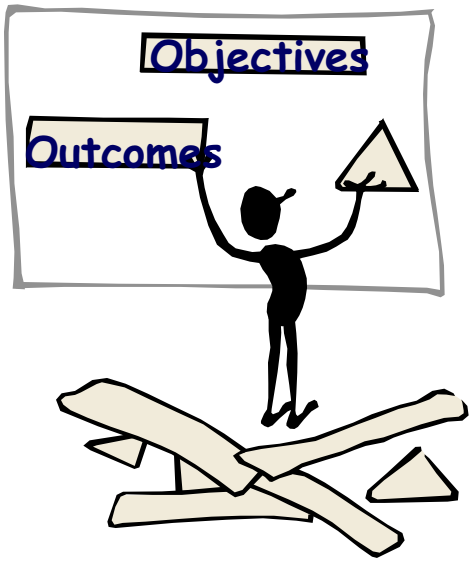


(Terenzini, JHE Nov/Dec 1989)

Classroom Assessment



G.Rogers, Rose-Hulman



✓Ethics and professional responsibility
✓Understanding of contemporary issues
✓Role of professionals in the global society and ability to understand diverse cultural and humanistic traditions
✓Teamwork
✓Communication skills
✓Skills and knowledge necessary for engineering practice
✓Interpret graphical, numerical, and textual data
✓Design and conduct experiments
✓Design a product or process to satisfy a client's needs subject to constraints

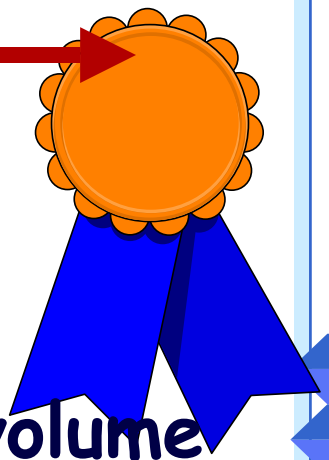
Mission is to produce graduates who are technically competent, can communicate and work with others effectively, demonstrate responsible citizenship and an awareness of the global context of their work, and are leaders in their field.

- Technical competence
- Effective communication
- Effective teamwork
- Responsible citizenship
- Global awareness
- Leadership


Performance Criteria
Program Outcomes
Educational Objectives
Ethics
Responsible citizenship
1)Demonstrate knowledge of professional code of ethics.
2)Evaluate the ethical dimensions of a problem in the discipline.

Performance Criteria: Acceptable standard of performance

Effective oral communication



- Personal appearance is appropriate
- Speaks clearly and with sufficient volume
- Achieves rapport with the audience
- Uses engaging vocalization
- Responds effectively to questions and comments
- Uses audience-appropriate vocabulary, content, and style

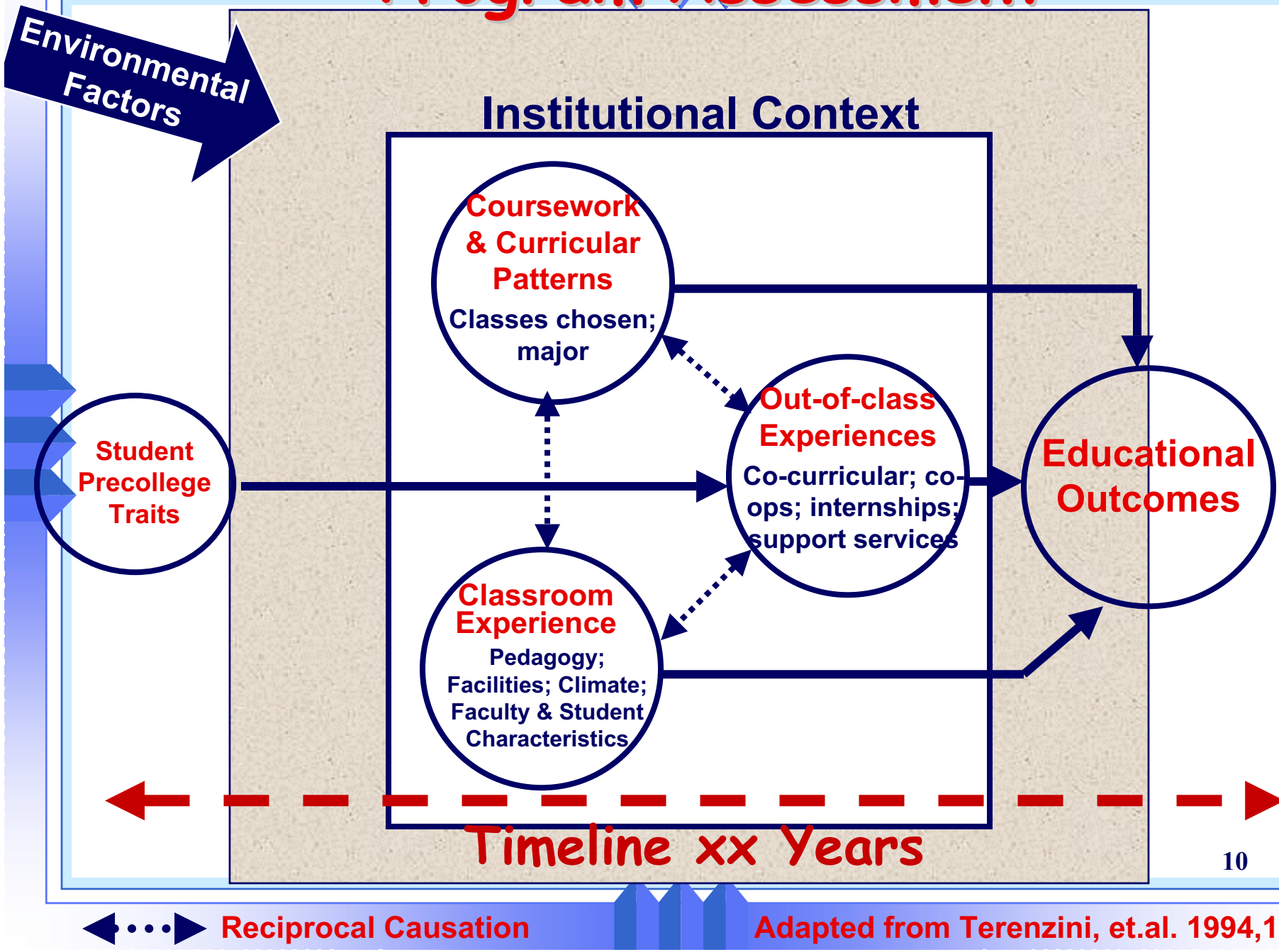
Public Speaking Evaluation Sheet

Student	Date:				
Title of Presentation					

Evaluation Scale: Yes, a lot (+) 4 3 2 1 0 No, not at all (-)

Criteria	Score		Totals
Presentation Style:			
1. Personal appearance is appropriate			
2. Speaks clearly and with sufficient volume			
3. Achieves rapport with the audience			
4. Uses engaging vocalization			
5. Responds effectively to questions and comments			
6. Uses audience-appropriate vocabulary, content, and style			
Presentation Style Total:			
Content:			
7. Uses the grammar of standard English			
8. Presentation includes introduction, body, and conclusion			
9. Organizes content logically and sequentially			
10. Presents ideas and arguments clearly and logically			
11. Uses appropriate audiovisual materials			
12. Cites sources appropriately			

Program Assessment

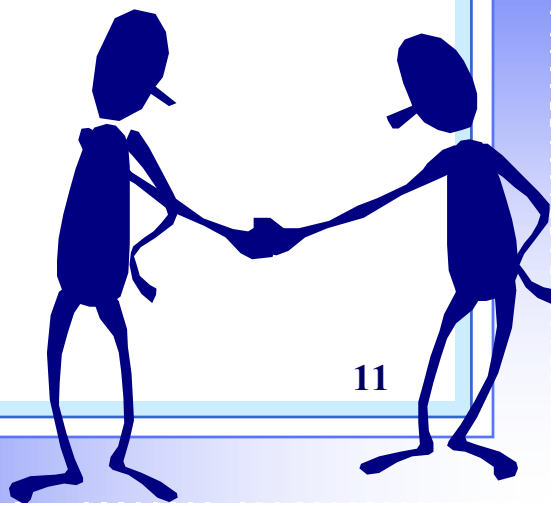


Reciprocal Causation

Adapted from Terenzini, et.al. 1994,1995

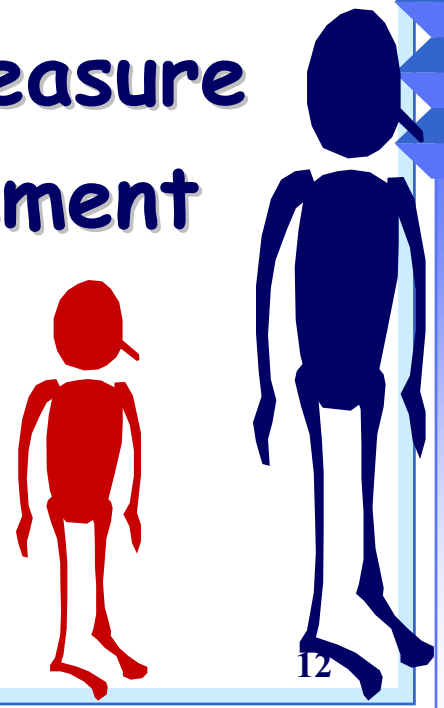
Similarities between classroom and program assessment

- Formative and/or summative
- Measure knowledge, skills, behavior, attitudes and values
- Focus on individual students or a group of students.



Differences between classroom and program assessment

- Degree of complexity
- Time span
- Level of specificity of the measure
- Accountability for the assessment process
- Level of faculty commitment
- Cost

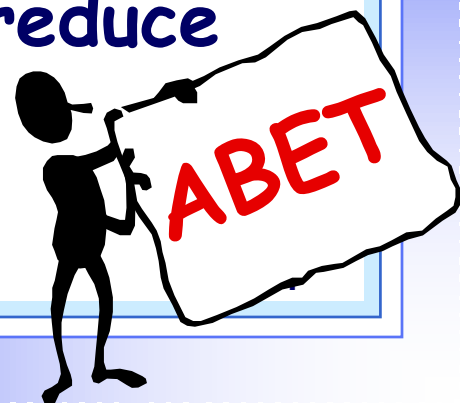


Assessment Methods

- Standardized exams
- Local developed exams
- Oral exams
- Performance Appraisal
- Simulations
- Written surveys and questionnaires
- Exit and other surveys
- Focus groups
- External examiner
- Behavioral observations
- Archival records
- Portfolios

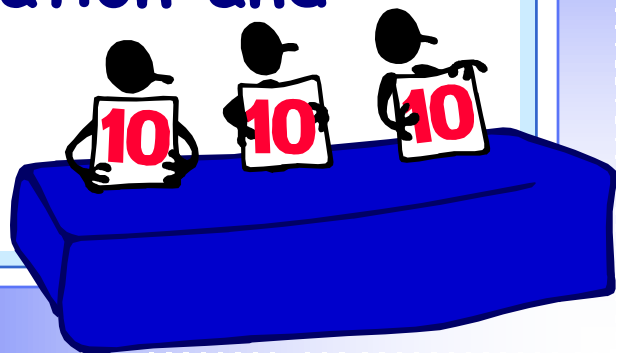
Summary of "Bottom Lines"

- All assessment options have advantages and disadvantages
- "Ideal" method means those that are best fit between program needs, satisfactory validity, and affordability (time, effort, and money)
- Crucial to use multi-method/multi-source approach to maximize validity and reduce bias of any one approach



Validity

- relevance - the assessment option measures the educational outcome as *directly* as possible (Direct line of sight?)
- accuracy - the option measures the educational outcome as *precisely* as possible
- utility - the option provides formative and summative results with *clear implications* for educational program evaluation and improvement



Assessment Method Truisms

- There will always be more than one way to measure any learning objective
- No single method is good for measuring a wide variety of different student abilities
- There is generally an inverse relationship between the quality of measurement methods and their expediency
- It is important to pilot test to see if a method is appropriate for your program

Advice from the field

- You cannot do everything (time and resources)
- All assessment questions are not equal
- More data are not necessarily better
- One size does not fit all
- Pick your battles
- Take advantage of local resources
- Don't wait until you have a "perfect" plan
- It does not happen in one year

References/Credits

Suskie, Linda. *Questionnaire Survey Research*, Association of Institutional Research. http://airweb.org/publications/airpublications.htm.

Rogers, Gloria. *"Model for Reporting EC2000: Criteria 2 & 3"*

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"Gloria Rogers' Materials"

References/Credits

1. Rogers, Gloria M. "EC2000 and Measurement: How Much Precision is Enough?" Journal of Engineering Education, March 1999.
2. Terenzini, Patrick T. "Assessment with Open Eyes," *Journal of Higher Education*, Vol. 60, No. 6 (November/December 1989. Ohio State University Press. pp. 644-664.
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5. Prus, J. and Johnson, R. "Assessment & Testing Myths and Realities." *New Directions for Community Colleges,* No. 88, Winter 94.