Outcomes-Based Education – An ABET Perspective

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Who am I?

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  • Adjunct Accreditation Director, Engineering Accreditation Commission
My Momma says I’m special ....

UN Sustainable Development Goals

www.un.org/sustainabledevelopment/
About ABET

- Forward-thinking, purpose-driven organization that accredits college and university programs in applied and natural science, computing, engineering and engineering technology

- Students, employers, and the society we serve can be confident that a program meets the quality standards that produce graduates prepared to enter a global workforce
35 Member Societies, 1.5M members
2,200 volunteers & 40 staff members

GLOBAL IMPACT
ABET-ACREDITED PROGRAMS PER COUNTRY

LEBANON (35)
PALESTINE (31)
POLAND (2)
AUSTRIA (1)
SPAIN (10)
UNITED STATES (3233)
PORTUGAL (2)
TURKEY (56)
MEXICO (88)
MOROCCO (3)
COLOMBIA (777)
ECUADOR (6)
PERU (46)
CHILE (5)
SOUTH AFRICA (1)
EGYPT (19)

RUSSIAN FDR (3)
KAZAKHSTAN (3)
JORDAN (26)
KWUWAIT (4)
BAHRAIN (12)
MONGOLIA (3)
QATAR (11)
CHINA (8)
PHILIPPINES (45)
VIETNAM (4)
INDIA (19)
SINGAPORE (1)
SAUDI ARABIA (159)
ACCREDITATION NUMBERS
AS OF OCTOBER 1, 2018

GLOBAL
4005 PROGRAMS 793 INSTITUTIONS

U.S.
3233 PROGRAMS 638 INSTITUTIONS

OUTSIDE U.S.
772 PROGRAMS 155 INSTITUTIONS

INCREASES SINCE 2017

153 PROGRAMS 17 INSTITUTIONS

BY COMMISSION

PROGRAMS

Global

204 (29%) 542 (15%) 2776 (39%) 420 (15%)

U.S.

81 (13%) 444 (23%) 682 (13%) 2386 (39%)

Outside U.S.

11 (7%) 358 (13%) 46 (5%) 590 (7%)

INSTITUTIONS

Global

77 (8%) 391 (31%) 544 (45%) 221 (18%)

U.S.

70 (7%) 322 (32%) 204 (20%) 442 (42%)

Outside U.S.

8 (9%) 60 (32%) 17 (9%) 125 (67%)
Value of ABET Accreditation

- ABET accredited programs recognized globally
  - Commitment to quality education
- Outcomes based approach
  - “What is learned” vs. “What is taught”
- Emphasis on Continuous Quality Improvement

Continuous Quality Improvement (CQI)

- ABET Criteria have been developed on the principles of continuous quality improvement
- On-going process to improve quality of student’s educational experience
  - Systematic process: documented, repeatable
  - Assess performance against criteria
  - Take actions to improve program
- Accreditation is a part of CQI
  - Verification that program meets certain level of quality, and CQI is part of the quality process
Eight General Criteria (Associate and Bachelor Level)

1) Students
2) Program Educational Objectives
3) Student Outcomes
4) Continuous Improvement
5) Curriculum
6) Faculty
7) Facilities
8) Institutional Support

Program Educational Objectives

- Program educational objectives (PEOs) are broad statements that describe what graduates are expected to attain within a few years of graduation

- Program educational objectives are based on the needs of the program’s constituents
Criterion 2: Program Educational Objectives

- Published and consistent with institution’s mission, the needs of the program’s constituencies, and these criteria
- Documented, systematically utilized, and effective process, involving program constituencies, for the periodic review of the program educational objectives

Student Outcomes

- Student outcomes describe what students are expected to know and be able to do by the time of graduation
- These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program
Criterion 3: Student Outcomes (EAC)

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Criterion 4: Continuous Improvement

• Regular use of appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained
• Results of evaluations systematically utilized as input for the continuous improvement of the program
• Other information, if available, used to assist in continuous improvement
Assessment

- Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes

- Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the outcome being measured

- Appropriate sampling methods may be used as part of an assessment process

Direct

- Standardized exams
- Locally developed exams
- Portfolios
- Simulations
- Performance appraisal
- External examiner
- Oral exams
- Behavioral observations

Indirect

- Written surveys and questionnaires
- Exit and other interviews
- Focus groups
Evaluation

• Evaluation: one or more processes for interpreting the data and evidence accumulated through assessment processes

• Evaluation determines the extent to which student outcomes are being attained

• Evaluation results in decisions and actions regarding program improvement

OBE – Not for me, right?

• Drivers
  • Quality assurance
  • Continuous improvement
  • Pride in your work
  • Competitive advantage
  • Required by NBA
Traditional vs. Outcomes-Based

- Traditional
  - What is taught
  - Grades/rank
  - Professor-centric
  - Sage on the stage

- Outcomes-Based
  - What is learned
  - Outcomes/goal
  - Student-centric
  - Guide on the side
  - Closing the loop: assess - feedback - improve

Thoughts about the process

- Outcomes provides a clear statement of what a student should be able to do
- Then you will/may need to
  - Align the curriculum
  - Revise the delivery as needed
  - Perform assessment to verify that learning has occurred and the outcome has been attained
  - Use the results as input for improvement
  - Rinse and repeat! This is a cycle!
Thoughts about program assessment

- Student learning is cumulative over time
  - What students learn in one course, they use, practice, and develop in other courses
- Focus of data collection in program assessment is on the cumulative effect of student learning and influences
  - When to collect data
  - From whom to collect data
  - Interpretation of the results

Thoughts about teaching and learning

- Learning occurs best when we build on what students already know
- Learning is an active process (importance of students’ active involvement in their own learning)
- Learners perform best when expectations for their learning is clear
- Learners perform best when they get feedback on their performance
  - Question: When I score student work, will students know their areas of strength and weakness and what they need to do to improve?
Performance Indicators

• Specific measurable statements
• Identifying the performance required to meet the Student Outcomes
• Confirmable through evidence

Rubrics

• Articulate the level of students’ performance
• Provides a description of what is expected at each level of performance

Think about it ….

How would you go about assessing teamwork in a group of students working on a project?
Work Effectively in Teams
(Holistic Rubric)

<table>
<thead>
<tr>
<th>Unsatisfactory</th>
<th>Developing</th>
<th>Satisfactory</th>
<th>Exemplary</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Does not collect any information that relates to the topic.</td>
<td>• Collects some information related to the topic but incomplete.</td>
<td>• Collects basic information related to the topic.</td>
<td>• Collects a great deal of information which goes beyond the basics.</td>
</tr>
<tr>
<td>• Does not perform any duties of assigned team role.</td>
<td>• Inconsistently performs duties that are assigned</td>
<td>• Performs duties that are assigned</td>
<td>• Performs all duties assigned and actively assists others.</td>
</tr>
<tr>
<td>• Always relies on others to do the work.</td>
<td>• Rarely does the assigned work—often needs reminding.</td>
<td>• Usually does the assigned work—rarely needs reminding.</td>
<td>• Always does the assigned work without having to be reminded.</td>
</tr>
<tr>
<td>• Is always talking—never allows anyone else to speak.</td>
<td>• Usually doing most of the talking—rarely allows others to speak.</td>
<td>• Listens most of the time</td>
<td>• Consistently listens and responds to others appropriately.</td>
</tr>
</tbody>
</table>

Example of Results

Work effectively in teams

Percent of students who perform at or above satisfactory level; n=60 (population)

50% Holistic
### Work Effectively in Teams

(Analytic Rubric)

<table>
<thead>
<tr>
<th></th>
<th>Unsatisfactory</th>
<th>Developing</th>
<th>Satisfactory</th>
<th>Exemplary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research &amp; Gather Information</strong></td>
<td>Does not collect any information that relates to the topic.</td>
<td>Collects very little information--some relates to the topic.</td>
<td>Collects some basic information--most relates to the topic.</td>
<td>Collects a great deal of information--all relates to the topic.</td>
</tr>
<tr>
<td><strong>Fulfill Team Role’s Duties</strong></td>
<td>Does not perform any duties of assigned team role.</td>
<td>Performs very little duties.</td>
<td>Performs nearly all duties.</td>
<td>Performs all duties of assigned team role.</td>
</tr>
<tr>
<td><strong>Share in work of team</strong></td>
<td>Always relies on others to do the work.</td>
<td>Rarely does the assigned work--often needs reminding.</td>
<td>Usually does the assigned work--rarely needs reminding.</td>
<td>Always does the assigned work without having to be reminded.</td>
</tr>
<tr>
<td><strong>Listen to Other Teammates</strong></td>
<td>Is always talking--never allows anyone else to speak.</td>
<td>Usually doing most of the talking--rarely allows others to speak.</td>
<td>Listens, but sometimes talks too much.</td>
<td>Listens and speaks a fair amount.</td>
</tr>
</tbody>
</table>

### Teaming Skills

Percent students with satisfactory or exemplary performance  
\( n=60 \) (population)

- **Research Information**: 55%
- **Fulfill Roles**: 38%
- **Share in work**: 25%
- **Listening**: 81%
CQI at work

- Mission
- Constituents
- Objectives (what one is trying to achieve vis a vis graduates)
- Outcomes (learning that takes place to meet objectives)
- Processes (internal practices to achieve the outcome)
- Facts (data collection)
- Evaluation (interpretation of facts)
- Action (change, improvement)

Leadership involvement

- Leaders as champions – moving away from the business as usual mindset
- Communication – it needs to be both ways!
- Training and support
- Recognition
Faculty involvement

- Continuous quality improvement is a human process
- Faculty are critical to success
  - Own the student outcomes and indicators
  - Evaluate results of assessment
  - Identify and design areas for improvement
  - Implement changes
  - Assess impact

Working through change

- Change is a process, not an event
- Individuals, not organizations, change-one by one
- Change is highly personal – each individual sees it in terms of how it affects him/her and work
- People go through phases, or stages, when trying to adopt a change
- Stages can be predicted and planned
Questions?

Thank you!

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