Improving ABET Assessment Processes at CalPoly

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Learning Outcomes

- Compare direct measures in terms of workload and effectiveness.
- Identify approaches to centralize assessment efforts.
- Improve surveys.
- Identify elements in a vision of a future assessment process.

Overview

- Characteristics of CalPoly
  - Impact on assessment processes
  - Presenting a college-wide overview
- Assessment methods
  - Direct & indirect measures, skills
- Evaluation methods and improvements
  - Drawing conclusions, validating improvements
- Engaging faculty & campus community, centralize efforts
- Future: More value to faculty, better impact in classroom
- *Let's discuss pros & cons!*
  - *Help participants critique or improve their processes?*
- *How we have implemented methods described by Gloria Rogers, results…*

Overview - Who Are We?

- CalPoly, San Luis Obispo, CA
- BS & MS programs only - Teaching & Learning emphasis at CalPoly
- ~5300 Engineering students (~1/4 university)
- 15 BS Engineering programs (including Computer Science, in CENG)
- 12 Reaccredidation (Fall 2008)
- 1 First-Time Accreditation (Software Engg)
- *Large student body creates challenges!*

Overview - General Approach

- Define 3-5 ‘skills’ associated with each A-K Outcome.
- Combine C9 Program-specific outcomes together with C3 A-K assessment
- Use direct and indirect measures
- Program-specific and ‘institutional’ improvements

My Role?

- Assistant Dean for CENG
- Provide suggestions, share best practices
- Run processes (surveys)
- Specific guidance, S-S template
- Also an ABET Program Evaluator
- Goals:
  - Create a culture of data-driven assessment.
  - Establish value with faculty - impact in classroom.

C3 Measures - ???

- Engage faculty?
- Provide surprising results (sometimes)?
- Readily identify areas for improvement?
- Robust, insensitive to evaluation criteria?

- *… These are good goals!*

C3 Assessment Instruments Vary Across College

- Locally-developed exams
  - Yield new information, beyond coursework
  - Multiple-choice or essay
  - Required in course, contributes to grade
  - Topics cover courses from Freshman to Senior level
- Embedded questions on finals
  - Faculty assessors review (2nd pair of eyes for ABET).
- Collection of student materials
  - Faculty assessors review via rubric
- Senior Project analysis
  - Required submission, as part of project write-up
  - 'Identify ethical issues associated with the use or misuse of your senior project.'
  - Project styles may vary, but analysis could be more consistent?

C3 Locally Developed Exams & Embedded Final Questions – Better!

- ‘Senior Exam’ (A ‘Local Exam’, G. Rogers)
  - Direct measure
  - Senior seminar or design course
  - 5% of course grade
  - Multiple choice & essay
  - *No preparation for student*
  - Questions identified by faculty (ABET Cmte, CC…)
- Flexible hitting all outcomes, existing student projects may be a stretch to hit all outcomes.
- Questions may address concepts spanning multiple courses.
- With a web-based, proctored, testing lab this would have no impact on class time, faculty time.

C3 Faculty Shocked By What Students Do NOT Know

- Try asking seniors questions from freshman, sophomore or junior-level classes…
  - A ‘worst-case’ measure
- Very different than reviewing materials from your courses
  - A ‘best-case’ measure
- Students often ‘bomb’ questions on local exam – splitting hairs to evaluate data is not necessary.
- *York: Gauge “Off the cuff” abilities on the job (Co-Op).*
- *Mercer: Using a 50% criteria as desired performance target*
- *Mercer: Defining exam can be divisive! (Yes, and healthy!!)*

C3 Institutional Data / Resources

- University Writing Proficiency Exam - Direct
- Career Services Surveys - fine tune for ABET
- (WASC) NSSE
  - National Survey on Student Engagement
  - Indirect, administered to freshman & seniors.
  - Comparisons with similar institutions, CSU system and national.
  - Limited use, ‘A third leg’.
  - Used to help identify improvement areas.
- (Future) WASC rubrics & direct measures - writing & LLL, University Learning Objectives

C3 GSS Survey Improvements

- Process: SurveyMonkey (paperless)
  - Centralized in Dean's Office. Institutionalizing process.
  - Download class list with re-prompts and hands-off operation for program reps.
- Form: Wording of A-K focuses on skills, not just outcomes
  - Better understandability by students.
- Content: Questions worded better
  - Included 'No Opinion'…
- Usage: Gauge benefit of improvements
  - Indirect measure used to help close the loop
- *Both process & program improvements.*

C2 Improvements to Alumni Surveys

- Asked specific questions on career accomplishments
- Collected via SurveyMonkey.
- Prompted with 'PolyLink', on-line community
  - Add optional response for contact info to update PolyLink
- Process Improvements
  - Subject line less likely flagged as spam
  - More energetic email message
  - Email prompt appears to come from Dept Chair
  - Increased span of years, 3-9 years back
  - New system provides count of outgoing prompts for response stats. 2x – 3x improvement, (now) typically 20%-40%
- Prize and gift, as with previous versions of the surveys.

C3 Example Skills & Measures…

- *Agglomerated versions – college-wide*
- Phrased with observable action verb.
- Preferably high on Bloom's scale, to improve retention.
- Attempt to identify multiple choice exam questions for efficient grading, essays otherwise.

C3 Example Skills & Measures: *Ethics & Professionalism*

- Identify situations with ethical concerns, e.g. NDA.
- Knowledge of X-E code of ethics.
- Identify situations with inappropriate professional behavior, e.g. sexual harassment .
- Assessment instruments:
  - Multiple choice questions
- *Emphasis varies in programs.*

C3 Example Skills & Measures: *Multidisciplinary*

- Recognize the value of a broad skill associated with an MD team, by identifying examples associated with a project.
- Rate examples of team communications and identify ways to improve team communications.
- Identify when problems occur due to poor interactions among team members and propose changes to improve team dynamics.
- Assessment instruments:
  - Describe a hypothetical team interaction, then ask students to identify problems and suggest remedies. Essay or multiple choice.
  - Essay on prior project experience.

C3 Example Skills & Measures: *Impact of Engr on Society*

- Cite examples of current or recent events in nation or world that could influence a student's career path or the field.
- Identify societal impact associated with a project or product.
- Identify a disruptive technology.
- Assessment instruments:
  - Essay or multiple choice

C3 Example Skills & Measures: *Contemporary Issues*

- Cite examples of science and technology to needs driven by society, health & safety, or the environment.
- Identify sustainability issues associated with a project or product.
- <u>Identify negative impact of science and technology on society, perhaps resulting from an unintended consequence</u>.
- Assessment instruments:
  - Describe examples open-ended question
- *Not high on Bloom's scale* ☹

C3 Example Skills & Measures: *Life-Long Learning*

- Able to learn new techniques, tools, or devices outside the classroom environment.
  - Cite examples from (Senior Project…)
- Find appropriate technical resources
  - Cite examples and compare quality (Senior Project…)
- Able to identify need for and to plan for additional training or learning
  - *Indirect*

(C4) Institutionalizing Processes

- Any difficulties managing documents?
- Example:
  - 13 programs submitting survey questions (or updates)
  - 13 data summaries, response stats…
- Using BlackBoard to organize docs
  - Bb site for each program
  - Post survey questions, download summary

(C4) Process Improvements

- (Less work, regular completion)
- Centralized surveys on SurveyMonkey
  - Paperless, Hands-off operation for programs
- College provides template for S-S covering university & college level issues.

C4 Changing the Culture On Program Improvements

- "Do we have to measure to know the sky is blue?"
  - We may not have to, but we need to convince our Evaluator!
- How will we know we have achieved a desired result for our students' improved abilities?
  - By yet another anecdotal observation?
- Data helps…
  - Prioritize improvement areas
  - Retire improvement areas, move on to new ones

C4 Program Improvements

- (C1) Grad advising
- (C3) Math/Science, Writing, Disciplinary skills (e.g. programming).
- (C3) Course changes…
- (C3-GE, getting the most from Gen Ed)
  - Teamwork in PSY course in GE
  - Wide Outcome coverage in Tech Writing
- Intro to engineering course
- ‘MD Certified’

C3/C4/C5 Where Do Students Practice Their MD Skills?

- At CalPoly, ‘MD Certified’ for graduation.
- New college-wide requirement.
- Programs each define list of one or more acceptable activities to meet certification.
- Mitigates throughput issues associated with a single venue.
- Flexible solution, not restrictive.

Activities for MD Requirement Are Varied

- (*As discussed in 2007-09 Cal Poly catalog)*
- Team senior project
- CO-OP or internship employment
- Certain club activities (e.g. EWB Project)
- Working with faculty on a sponsored project
- Project embedded in curriculum
- Taking certain courses
- Service learning project

C4 Were Your Improvements Beneficial?

- *Required:*
  - *Close the loop*
  - *Summative (Outcomes) assessment*
- A desirable method is probably to wait for impact of change to bubble up to direct measures of seniors.
- What about validating
  - Small changes?
  - Changes with diffuse effect (freshman course)?
- Validation may be difficult sometimes!

C4 Were Your Improvements Beneficial?

- Suggest: Deploy a survey specific to improvements.
- Deploy in the course specific to the change
  - Course following a prerequisite change, e.g.
- Involve a control group
  - Parallel sections taught by two different methods

(C4) Getting Traction With Technology

- Prior pilots too complex, even with a small user group
- Bb fine
  - Document management
  - Post office boxes (surveys)
  - Parallel access (syllabi and resumes)
- SurveyMonkey
  - GSS & Alumni
  - Prefer Additional Feature: summarize with categories

Future Vision - Goals

- To provide more effective feedback on students for faculty
- Feedback that is formative as well as summative.
- Feedback that hits closer to instructor's day-to-day classroom efforts.

Future Vision for a Process - Elements

- Longitudinal tracking of students
- ABET summative measures
- ABET-style formative direct measures
- Other assessment measures (WASC)
- University measures (writing exam)
- Student demographics
- Student learning styles / communities

Future Vision of a Process - Benefits

- Provide data for educational research studies
  - Benchmark pedagogical changes
  - Compare consistency of tools that measure or predict student success
  - Diagnose systemic problems
- Provide data for ABET
  - Have control group data, as a baseline

Goal: Promoting A Culture Change

- *"We can still learn from an imperfect assessment process."*
  - Derek Bok, 'Our Underachieving Colleges'
- "*It sure is nice to have all this data to review when considering curricular changes*!"
  - CalPoly faculty member (recent)

Conclusion

- ‘All or bomb’ direct measures
  - Engage faculty. Shock value.
- Centralize efforts
  - Surveys, S-S template
- Future: Longitudinal studies and assessment.
- Appropriate technology
  - Technology / processes that people will use

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