

Assessing Information Literacy in Engineering: Integrating a College-wide program with ABET-driven assessment

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Introduction

- Rising importance of information competencies
- Association of College and Research Libraries (ACRL) standards
- Regional accreditation bodies
- Campus-wide programs



Background

- Small, private, liberal arts college
- Formal IL program began in 2003/2004
 - Previously: classroom instruction sessions
 - Initially: first year, writing intensive courses
 - Now: Curriculum-integrated approach, departmental standards, sequenced, discipline-specific, ACRL-based
 - Librarians work with departments to develop standards
 - 14 departments have programs (nearly 40%), 23 in discussion
- Phase Two : Assessment
 - Data collected and analyzed in pilot department
 - Evidence in both student work and testing



Engineering at Smith

- ABET-accredited since first graduates in 2004
- How can IL assessment dovetail with ABET assessment?
- Engineering's IL standards draw on ACRL standards for higher education as well as for science and technology (ILST) – hybridized these
- Challenge: how to relate ABET and ACRL?

ACRL and ABET

- ACRL/ILST performance indicators - highly detailed
- ABET outcomes broader - detailed abilities brought as *evidence* of outcome achievement
- ABET outcomes analogous to ACRL/ILST standards
- Performance indicators potential measures of ACRL/ILST standard or ABET outcome fulfillment
- How to relate ABET outcomes with ACRL/ILST standards – and design assessment plan for information literacy?

Prior Work

- Others have done this, but each institution has unique outcomes
 - Some institution-specific, some specific to type of engineering/technology
- Most others place information literacy in “lifelong learning” (LLL) category
 - Advantage 1: concretizes LLL – easier to assess
 - Advantage 2: Relating it to one outcome is simple

Our Approach

- Some IL standards clearly overlap with ABET outcomes in communication and ethics – LLL is not enough
- In both Smith's outcomes and ABET's a-k, problematic assumption that **the only data engineers work with are those generated through experimentation**
- Need to account for information gathered in other ways, particularly through existing information resources (IL)
- Mapped IL to 4 of 10 Smith Outcomes in LLL, ethics, communication, and experimentation/data
 - First round of mapping – provisional – comments welcome!

Mapping Standards: Lifelong Learning

ACRL/ILST Standard(s)	ABET Outcome
The information literate student understands that information literacy is an ongoing process and an important component of lifelong learning and recognizes the need to keep current regarding new developments in her or his field. [ACRL 3 /ILST 5]	i: a recognition of the need for, and an ability to engage in life-long learning

Smith Outcome	Performance Criteria
Life Long Learning: the ability to apply the fundamentals of how people learn to one's own education and life goals, and to use this knowledge to engage others in learning	<p>the student demonstrates self-directed learning as a continual feedback spiral in which students are</p> <ul style="list-style-type: none">· self managing, (in which students articulate their own learning goals)· self monitoring,(in which students assess their achievement)· self modifying (in which students make midcourse corrections) <p>students design a learning experience for others using knowledge of how people learn</p>

Mapping Standards: Ethics

ACRL/ILST Standard(s)	ABET Outcome
The information literate student understands the economic, ethical, legal, and social issues surrounding the use of information and its technologies [ACRL 5 /ILST 4]	f: an understanding of professional and ethical responsibility h: the broad education necessary to understand the impact of engineering solutions in a global and societal context j: a knowledge of contemporary issues

Smith Outcome	Smith Performance Criteria
Ethics: the ability to think critically and act reflectively in relation to engineering ethics and professional responsibility	the student can critically analyze a case study in engineering ethics or professional responsibility the student can synthesize critical thinking and personal reflection in the process of decision making and other action related to engineering ethics and professional responsibility

Mapping Standards: Communication

ACRL/ILST Standard(s)	ABET Outcome
Either as an individual or as a member of a group, the information literate student uses information effectively, ethically, and legally to accomplish a specific purpose. [ACRL/ILST 4]	g: an ability to communicate effectively

Smith Outcome	Performance Criteria
Communication: the ability to communicate effectively with a wide range of audiences using different modalities (visual, oral and written)	the student exhibits a clear writing style (readable, concise, cohesive) the student demonstrates an ability to effectively articulate an idea, argument or design the student is able to select and create an appropriate graphical representation for data

Mapping Standards: Experimentation

ACRL/ILST Standard(s)	ABET Outcomes
<p>The information literate student determines the nature and extent of the information needed. [ACRL/ILST 1]</p> <p>The information literate student accesses needed information effectively and efficiently. [ACRL/ILST 2]</p> <p>The information literate student evaluates information and its sources critically and as a result, decides whether or not to modify the initial query and/or seek additional sources and whether to develop a new research process. [ACRL/ILST 3]</p>	<p>b: an ability to design and conduct experiments, as well as to analyze and interpret data</p> <p>k: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</p>
<p>Smith Outcome (revision shown in <i>italics</i>)</p> <p>3. Experimentation <i>and Data</i>: the ability to generate, <i>access</i>, evaluate, and understand data [ABET k, b]</p>	<p>Performance Criteria (revision in <i>italics</i>)</p> <p>the student is able to design and conduct experiments</p> <p>the student is able to analyze and interpret data</p> <p><i>the student is able to access and evaluate information</i></p>

Assessment Plan: E-Portfolios

- More complete picture than traditional assessment
- Students collect, align work to outcomes and performance criteria - tracks achievement over time
- Students upload evidence and write reflections on progress
- Student-driven; their responsibility to select evidence and reflect upon its meaning
- Portfolio itself evidences life-long learning



E-Portfolios: Assessment Process

Student Assessment

- Course level – faculty reviews portfolio within course – immediate feedback
- Program Level - panel review after sophomore year and near graduation
 - Panel includes faculty and librarian

Curriculum Assessment

- Course Level - Every semester engineering faculty evaluates program outcomes addressed in individual courses
 - Addresses modifications from previous semesters, evidence collected, and methods of analysis for each outcome
 - Percent of students meeting performance criteria for each outcome
 - Recommendations for course and program modifications
- Program Level - Review of recommendations by the entire engineering faculty in conjunction with findings from the portfolio assessments

E-Portfolios: Possible Evidence for IL

- First year tutorials - certificates of completion
- Annotated bibliographies from first-year course project on life-cycle assessment (ability to identify, access and evaluate a variety of resources);
- Homework assignments and test problems from a first-year course (ability to access and evaluate information)
- Ethics case analyses related to information
- Reports from design projects, labs, problem sets, independent research citing engineering literature (ability to access and evaluate information, cite information ethically and in proper format, and utilize information to accomplish a particular purpose).
- Reports/problem sets include working with and generating data presented in tabular and graphical formats
- Design clinic projects (access and evaluate data and/or collect new data, and report these data in a formal report to a real-world client with proper citations)

Conclusions

- Mapping to link ACRL/ILST standards & ABET outcomes
 - Beyond lifelong learning because information skills develop across several technical and professional outcomes
- Assessment plan uses electronic portfolios
 - initial instructor feedback, sophomore formative assessment and senior summative assessment by panel
- Outcome revision reflects importance of information literacy and widespread use of data not taken by an individual engineer

Recommendation

- ABET should revise criterion 3(b) (“an ability to design and conduct experiments, as well as to analyze and interpret data”) to support information literacy as a critical component of professional preparation for engineers.
- An example of suggested new language for this outcome might be “**an ability to access and evaluate information**, as well as to design and conduct experiments to collect, analyze, and interpret original data.”