

III.B.**Assessment of Student Learning Outcomes**

Faculty review, discuss, and evaluate learning outcome data and related activities from the prior academic year. The annual report (template below) contains two parts: 1) A summary of the evidence collected during the prior year on student learning, faculty *interpretation* of the evidence, and *implications* for program improvement; and 2) An outline plan of learning outcome assessment to be completed during the current academic year. Other assessment data regarding program effectiveness that may not be done annually, such as exit interviews, alumni surveys, advising surveys, and the like should also be collected for inclusion in the program review report. The five year program review report will include a two page summary synthesizing information gleaned from all assessment activities (not including the tables and/or graphs used to present data).

Narrative

Humboldt State University
Academic Outcome Assessment Data Analysis & Report for AY 2010-11
Due September 30, 2011

College: College of Natural Resources and Sciences
Department: Environmental Resources Engineering
BA or BS Major/Credential/Masters: BS
Report prepared by: Eileen M. Cashman
Report Date: September 30, 2011

This report is due September 30 for each program offering a BA or BS, a credential, and/or a Master's degree. (Please note that minors will be added to the above listing for the 2011-12 cycle).

Executive summary of outcome assessment project.

The ERE Spring 2011 assessment was devoted to evaluating technical writing within the program. The ERE faculty selected lab reports from a 300 level engineering course and evaluated the technical writing in 11 different categories ranging from coherence to format. Assessment results indicate satisfactory results in 7 of the 11 categories. The ERE department will take specific actions to address the lowest scoring category (format and conventions) and continue to monitor and develop opportunities for students to practice technical writing. As a department, we will continue to work toward a goal of 80% of the documents assessed ranked as satisfactory or higher in all criteria. In addition, we will seek assistance on appropriate sampling strategies for selected student work to evaluate.

Statement of outcome(s) assessed during this cycle and the outcome issue or problem being explored.

The ERE Spring 2011 assessment was devoted to evaluating technical writing within the program. The ERE faculty initiated the second component of a five-year writing evaluation program developed in 2009 (see Appendix 1).

The ERE faculty assessed the written communication component of Program Objective 4:

- ERE graduates will communicate effectively in written, spoken, and visual formats with technical, professional, and broader communities.

This assessment also addresses the written communication component of ERE Program Learning Outcome IV

- ERE graduates will be able to effectively and professionally communicate ideas and technical information to the public and to fellow engineers and other professionals in written and oral reports.

This ERE program learning outcome corresponds to the Accrediting Board for Engineering and Technology's (ABET) outcome **g**, an ability to communicate effectively.

Describe how the outcome(s) was (were) assessed.

ERE Program Objective 4 and Learning Outcome IV were evaluated using a process developed by the ERE faculty in spring 2009. The faculty identified five separate types of writing assignments (design reports, literature reviews, lab reports, posters and memos) and set up a five-year cycle in which to assess each of these types. A matrix that

summarizes this process is attached in Appendix 1.

For the second round of this assessment, the faculty chose to evaluate a lab report written by students as part of the requirements for Engineering 333: Fluid Mechanics. The faculty member who taught this course provided 12 lab reports from students enrolled in Engineering 333 during the Spring 2011 semester. All student names were removed. The original scores assigned to the reports were also removed, and covered the full range of poor to excellent grades.

The lab reports were assessed with a common rubric (attached in Appendix 2) that evaluated ten attributes of the written memos as either 1 - unsatisfactory, 2 - acceptable or 3 - exceptional. Five ERE faculty met to conduct the assessment. After a brief review of the assessment rubric, all faculty evaluated a single lab report to calibrate the process. The results of the initial assessment were discussed and it was determined that the use of the rubric was consistent among all faculty. Several modifications were made to the rubric. The modifications included:

- Breaking up the component of organization and format/conventions into two categories
- Softening the wording on the category descriptions for acceptable (2). The specific modifications are highlighted in yellow in the attached rubric.

Each faculty member then assessed two to four lab reports and submitted the results to be compiled. The instructor who initially assigned and graded this assignment did not participate in the individual assessment, but rather collated the data as it was completed.

Describe the major findings.

Table 1 below presents a summary of the assessment results. The right hand column presents an abbreviated listing of the attribute evaluated. Further details of the attributes are listed in Appendix 2.

Table 1: Summary of Assessment Results for Technical Lab Report

Attribute	% ranked as unsatisfactory	% ranked as satisfactory	% ranked as exceptional	Average Score
Coherence	9	64	27	2.1
Major points fully developed	9	82	9	2.2
Format and conventions	55	45	0	1.5
Organization	0	82	18	2.2
Content	27	45	28	1.9
Actions or Recommendation	14	68	18	2.0
Paragraph and sentence structure	36	45	19	1.9
Concision and length	5	86	9	2.1
Appropriate tone	27	64	9	1.8
Grammar, punctuation, spelling	0	91	9	2.1
Aesthetics	18	73	9	2.0

These results stimulated a useful discussion of the assessment process we conducted, the general writing effectiveness of our students and the specifics of the assignment we chose to assess.

We determined that the assessment process – selecting a writing sample and assessing the sample using a commonly calibrated rubric - was a useful and effective approach. We also found that there was general agreement among department members on the criteria for ranking writing attributes as unsatisfactory, satisfactory and exceptional.

In the last assessment of writing, the department agreed on a goal of 80% of our documents scoring as satisfactory or higher for all criteria. The goal of 80% of the student work evaluated scoring satisfactory or higher was achieved for 7 out of the 11 criteria. The criteria that require attention were format and conventions, content, paragraph and sentence structure and appropriate tone. The faculty identified the high percentage of unsatisfactory scores associated with format and conventions (55%) as particularly problematic.

We also discussed our sampling strategy of selecting a range of lab reports with poor to excellent grades without consideration of the actual grade distribution in the class. It is possible that we oversampled the low end of the lab reports in terms of grades and thus skewed the results. We will reconsider this strategy for our next writing assessment.

Describe the impact of the results on the program/department.

In evaluating the assessment results for ERE Objective 4 and Outcome IV, the ERE faculty concluded that ERE students’ ability to effectively communicate was satisfactory for 7 out of the 11 criteria evaluated. Thus, the primary actions identified by the ERE Faculty are to:

- Continue the writing assessment using the identified protocol and evaluate trends in the results. The next writing assessment will be conducted during our spring assessment meeting in May 2012.

- Continue our focus on improving students' writing skills in the Engr 325/Engr 326 (Computational Methods) sequence. In these courses, we have hired outside technical writing consultants to work with students on the project reports. Students receive graded feedback on multiple intermediate products throughout the semester.
- Continue to work toward a goal of 80% of the documents assessed ranked as satisfactory or higher in all criteria. In addition, we will seek assistance on appropriate sampling strategies for selected student work to evaluate.
- To address the problems identified with format and conventions, we will develop a list of conventions that the department agrees are universal expectations for technical documents (i.e. graphs with axes labeled, figure captions below figures, table titles above tables). Department faculty teaching 300-400 level courses will use this check list as a pre-screening tool and refuse to accept papers that do not meet the requirement.
- Begin to investigate a method to implement more formalized peer editing in the undergraduate program. This will include identification of potential courses and software that could be used to facilitate peer editing.

The Engineering department is currently in the process of evaluating their entire assessment plan develop for the purposes of ABET accreditation. An assessment subcommittee has been formed and we are currently "assessing our assessment" plan. Specifically, we have identified our on-going assessment tools as either indirect or direct assessment and mapping these tools to our student learning outcomes. The results of this evaluation may result in some modifications to our assessment plan. These modification will be in place this spring and reported in the next assessment cycle.

Appendix 1: ERE Writing Plan

Developing Discipline-Specific Writing Skills for Majors in Engineering

(1) Identify a document type produced in the discipline, its purpose, and its readers	(2) List the central characteristics, as applicable, of the document type	(3) List the course(s)/typical assignments where writing the document is introduced, developed, mastered
<p>Document type: Technical or Project Reports</p> <p>Purpose: Describe work undertaken and completed to develop a design solution.</p> <p>Reader(s): Clients Fellow engineers and scientists</p>	Organization	Technical reports are organized in sections that typically include: Executive Summary, Introduction, Approach or Methods, Results, Discussion, and Conclusions.
	Content:	Technical reports summarize the approach, results and conclusions made from the analysis and design of an engineering problem.
	Format and conventions	Technical reports are organized in sections; thus, it is important to include a proper Table of Contents. Additionally, most technical reports will include many Tables and Figures. Proper formatting and inclusion of Tables and Figures accompanied by List of Tables and List of Figures at the front of the document is important.
	Disciplinary context	A technical report must be written in correct technical language and vocabulary. However, the language must not be full of jargon because educated professionals other than engineers and clients must be able to understand the document content.
	Other	References follow discipline specific guidelines such as the American Geophysical Union Reference Style sheet (http://www.agu.org/pubs/AuthorRefSheet.pdf)
		<p>Introduced: Course(s): ENGR 215</p> <p>Typical assignment(s): ENGR 215 introduces students to the design process through an introductory-level semester long design problem. Their technical report summarizes their work.</p> <p>Developed: Required Course(s): ENGR 313, 322, 326, 351, 410, 416, and 440</p> <p>Typical assignment(s): Evaluate a design or analyze an environmental problem and write a technical report summarizing your work.</p> <p>Mastery demonstrated: Course(s): ENGR 492 - Capstone Design, Engineering Design Electives</p> <p>Typical assignment(s): ENGR 492 students undertake a semester-long project to design a solution for a client-identified problem. Their technical report presents the culmination of their semester project.</p>

Developing Discipline-Specific Writing Skills for Majors in Engineering

(1) Identify a document type produced in the discipline, its purpose, and its readers	(2) List the central characteristics, as applicable, of the document type	(3) List the course(s)/typical assignments where writing the document is introduced, developed, mastered
<p>Document type: Literature Reviews</p> <p>Purpose: The primary purpose is to learn the professional</p>	Organization	Literature reviews are typically organized chronologically to summarize the development of knowledge and understanding of a topic.
	Content:	Literature reviews summarize the current scientific knowledge about, or engineering approaches for, a particular topic.
		<p>Introduced: Course(s): ENGR 351</p> <p>Typical assignment(s): ENGR 351 introduces students to a literature review by requiring each student to research and characterize the risk of a pathogen or toxin. A list of possible topics is provided by the instructor.</p>

<p>literature through thorough research of the peer-reviewed publications to become knowledgeable about a topic.</p> <p>Reader(s): Fellow engineers and scientists</p>	Format and conventions	Literature reviews are commonly organized in paragraph form. The paragraphs are organized so that a single paragraph is devoted to each substantial research contribution or significant paper on the topic.	<p>Developed:</p> <p>Required Course(s): Engineering design electives (441, 445, 451)</p> <p>Typical assignment(s): Conduct technical research on an environmental engineering problem or topic and write a research review paper.</p> <p>Mastery demonstrated: ENGR 492 - Capstone Design</p> <p>Typical assignment(s): As part of their semester-long project to design a solution for a client-identified problem, students must research the topic and potential solutions. Their review of the relevant literature becomes a sub-section of their final technical report.</p>
	Disciplinary context	Proper citations and referencing are very important as the primary use of the paper is to summarize the literature. Proper citations also allow readers to evaluate the thoroughness of the literature research.	
	Other	References follow discipline specific guidelines such as the American Geophysical Union Reference Style sheet (http://www.agu.org/pubs/AuthorRefSheet.pdf)	

Developing Discipline-Specific Writing Skills for Majors in Engineering

(1) Identify a document type produced in the discipline, its purpose, and its readers	(2) List the central characteristics, as applicable, of the document type	(3) List the course(s)/typical assignments where writing the document is introduced, developed, mastered
<p>Document type: Laboratory Reports</p> <p>Purpose: Describe laboratory experiments and their results</p> <p>Reader(s): Engineers and scientists using the experimental results or trying to repeat the experiments or measurements.</p>	Organization	<p>Laboratory reports are organized in sections that typically include: Introduction (clearly stating the purpose and objectives), Methods, Results, Discussion, Conclusions, and Appendices.</p> <p>Introduced: Course(s): ENGR 115</p> <p>Typical assignment(s): ENGR 115 introduces students to conducting engineering measurements and laboratories, and learning how to graphically present data and write reports following the appropriate format.</p>
	Content:	<p>Laboratory reports summarize the methods, results and conclusions of an experimental analysis.</p> <p>Developed: Required Course(s): ENGR 325, 326, 331, 333, 351, 416, and 440.</p> <p>Typical assignment(s): Conduct an experiment to collect data, analyze the data and write a 4-8 page laboratory report.</p>
	Format and conventions	<p>Laboratory reports are organized in sections similar to technical reports but they are generally short so do not typically include Table of Contents, List of Tables and List of Figures, etc. Most laboratory reports will include Tables and Figures so proper formatting and inclusion of Tables and Figures is important.</p> <p>Mastery demonstrated: Course(s): Engineering Design Electives (448, 451, 471, 473, 475, and 477)</p> <p>Typical assignment(s): In their engineering design</p>
	Disciplinary context	<p>A laboratory report must be written in correct technical language and vocabulary.</p>

Other		electives, students conduct experiments on existing or student-designed systems, analyze the data and write laboratory reports describing their findings.
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Developing Discipline-Specific Writing Skills for Majors in Engineering

(1) Identify a document type produced in the discipline, its purpose, and its readers	(2) List the central characteristics, as applicable, of the document type	(3) List the course(s)/typical assignments where writing the document is introduced, developed, mastered
<p>Document type: Poster Presentations</p> <p>Purpose: Summarize a research or engineering project in a succinct and graphically pleasing manner for efficient information transfer and to initiate discussion.</p> <p>Reader(s): Fellow engineers and scientists</p>	Organization	Poster presentations are organized similar to a Technical Report (Introduction, Methods, Results, Discussion, Summary/Conclusion) but rely as much on text as graphics.
	Content:	Poster presentation content includes an Abstract, Introduction, Methods, Results, Discussion, and Summary/Conclusion. A poster uses minimal text to describe a project. Clear graphical presentation is emphasized.
	Format and conventions	Conventional poster presentations limit the poster size to approximately 3-ft x 5-ft. The poster is a standalone summary balancing text and graphical results.
	Disciplinary context	Poster presentations are used at scientific and professional conferences to succinctly summarize projects and initiate discussion amongst the poster presenters and other conference attendees.
	Other	References follow discipline specific guidelines such as the American Geophysical Union Reference Style sheet (http://www.agu.org/pubs/AuthorRefSheet.pdf)
		<p>Introduced: Course(s): ENGR 215</p> <p>Typical assignment(s): ENGR 215 introduces students to the design process through an introductory-level semester long design problem. Their poster presentations summarize their works and are used for presenting each group's findings to their peers and invited evaluators.</p> <p>Developed: Required Course(s): ENGR 351</p> <p>Typical assignment(s): Conduct a water quality analysis for a client (e.g. City of Arcata) and present the findings through a poster presentation to fellow students and invited evaluators.</p> <p>Mastery demonstrated: Course(s): ENGR 492 - Capstone Design, some Engineering Design Electives</p> <p>Typical assignment(s): ENGR 492 students undertake a semester-long project to design a solution for a client. A poster presentation follows their final presentation to allow the project client, invited evaluators and other students to ask more detailed questions.</p>

Developing Discipline-Specific Writing Skills for Majors in Engineering

(1) Identify a document type produced in the discipline, its purpose, and its readers	(2) List the central characteristics, as applicable, of the document type	(3) List the course(s)/typical assignments where writing the document is introduced, developed, mastered

<p>Document type: Memos</p> <p>Purpose: Describe actions taken, recommendations or document project progress to supervisors, clients or co-workers.</p> <p>Reader(s): Clients Supervisor Fellow engineers and scientists</p>	Organization	Memos are organized to efficiently report status and actions or recommendations.	<p>Introduced: Course(s): ENGR 115</p> <p>Typical assignment(s): ENGR 115 introduces students to the proper format and tone of a memo by requiring students to communicate laboratory decisions in memo format.</p> <p>Developed: Required Course(s): ENGR 215, 313</p> <p>Typical assignment(s): Use proper memo format and content to communicate decisions and updates concerning the course project to instructor and project team mates.</p> <p>Mastery demonstrated: Course(s): ENGR 410 - Environmental Impact Assessment</p> <p>Typical assignment(s): ENGR 410 students communicate analysis and interpretation of environmental regulations to a supervisor and group project teammates in memo format.</p>
	Content:	Memos include a clear introduction and description of the issue and the action or proposed actions to resolve it.	
	Format and conventions	Memos are written in paragraph form using clear organization into paragraphs addressing the problem description, current status, and proposed or completed action. Good memos also include clear Subject, To, From and cc lists.	
	Disciplinary context	Memos are used to convey short but important interpretations, project status summaries or analysis to a supervisor, client or regulatory agency. Memos often serve as record of decisions made throughout the course of a project.	
	Other		

Appendix 2: Scoring Criteria for Technical Writing

Attribute	Unsatisfactory (1)	Acceptable (2)	Exceptional (3)	Score
Coherence in paper	Subject is unclear. Cannot follow logical train of thought.	Subject is generally clear and logical train of thought is maintained throughout most of the paper.	Writing enhances the importance of subject; relentlessly logical throughout the paper.	
Major points fully developed. Supporting evidence is understandable and well organized.	Insufficient, uneven, unequal, or repetitious development of key points. Supporting evidence insufficient or missing.	Most key points developed and supported. Supporting evidence is relevant but insufficient to completely back up all key points.	All key points fully developed and supported. Supporting evidence is well organized and complete.	
Organization of paper	Structure not obvious to reader. Transitions between ideas sharp and dis-jointed. Lengthy digressions not important to key points.	Standard memo organization, or follows outline given by editor/teacher. Digressions kept to a minimum.	Clear, effective and appropriate structure that communicates key points easily. No digressions.	
Format and Conventions	Missing conventions such as To, From and CC lists on memos, appropriate table and figure titles, headings and other organizing features.	Clear subject, To, From and CC lists. Most conventions consistent throughout the document.	Format and conventions are completely correct and consistent.	
Content	Purpose/objective unclear. Project status or analysis is not clearly conveyed and would not serve as an adequate record of decision.	Purpose or objective is clearly stated with attempt to convince reader that the objective is important. Adequately conveys project status or analysis.	Purpose clearly stated, and reasons why objectives are important are clear and persuasive. Memo clearly conveys project status or analysis and provides a record of decision throughout course project.	
Actions, Recommendation or conclusion	Recommendation/Conclusion missing or a simple reiteration of previous text.	Recommendation/Conclusion is generally clear and attempts to link topics/objective mentioned in Intro to findings in report.	Recommendation/conclusion is clear and effectively links topics mentioned in Intro to findings in report.	

Appendix 2: Scoring Criteria for Technical Writing--Mechanics

Title of Paper/Article/Report _____

Scoring by: _____ Date: _____

Attribute	Unsatisfactory (1)	Acceptable (2)	Exceptional (3)	Score
Paragraph and sentence structure	Missing or unclear topic sentences. Central idea within paragraph is undeveloped. Simple and unvarying sentence structures.	Topic sentences readily identifiable. Paragraphs contain sentences that support the TS. Sentence structure varied and interesting.	All "acceptable" criteria plus attention to transitions between paragraphs. Linking of terms or ideas from sentence to sentence.	
Concision, length	Report or sections that are too long or repetitive. Text that obviously could have been better presented as graphics.	Minimal awkwardly redundant text. Good use of graphics to reduce amount of text.	Information presented such that no repetition necessary. Creative use of graphics to reduce text.	
Appropriate tone and reading level for intended audience	Informal, slang, or unprofessional usage. Too much jargon. Tone is inappropriate.	Professional tone and appropriate terminology for intended audience.	All "acceptable" criteria plus text and graphics that allow reader to follow a complex topic, and possibly enjoy it.	
Grammar, punctuation, spelling errors	Numerous grammar, punctuation, or spelling errors	No spelling errors. A few grammar or punctuation errors found in complex sentences.	Strong command of language (e.g. when style rules are infrequently broken, the reader understands emphasis rather than error.)	
Presentation, aesthetics.	General sloppiness as evidenced by inconsistent headings, fonts, point size; bad page breaks, etc. Poor use of color	Neat and clean presentation, without overuse of headings, fonts, or point size changes. Appropriate use of color.	All "acceptable" criteria plus page layouts that place graphics and text while considering composition, white space, balance. Outstanding use of color.	

Reviewer's Comments

Carol Holder's comments on III.B. Environmental Resources Engineering

Posted 12/31/2011

Thank you for a thorough, well-written report on your assessment of students' skills in writing technical reports (a fine example of excellent technical writing, appropriately enough!). Readers of this report will appreciate the multi-year planning, the assessment of the assessment, the detail on rubrics, and the discussion of the impact of this 2010-2011 project in ERE.

Strengths of the project and report include developing, testing, and modifying a scoring rubric and also departmental discussions about student writing skills and assessment of the assessment process itself. Also strong are the plans for "closing the loop" – using the results of this assessment to make modifications to instruction, specifically creating a list of conventions appropriate to the document type, using the list for screening acceptability of papers submitted, and investigating solid peer-evaluation or peer-editing programs.

Additionally, I would suggest that you share the list of conventions once you've developed them with all of your students, when the assignment is presented. Also, check out the on-line peer-evaluation system developed by UCLA chemistry faculty. HSU chemistry faculty may already be familiar with this, and you can find examples of its use in a variety of disciplines via Google (search on "Calibrated Peer Review" or CPR).

What I would encourage in future assessment projects in ERE is selecting student work from more than one course, in order to have a better basis for drawing conclusions about program effectiveness (as opposed to effectiveness of just one course).

Also, as your comments indicate, you recognize the importance of sampling methodology in order to avoid getting "skewed" data. As the department faculty become more adept at using the scoring rubric, I think you'll find that you can increase the size of your sample as well.

Your report doesn't speak to this, but it would also be helpful if you had a way to check and report on the

reliability of the scoring. For example, papers could be scored by two faculty members independently. If the rubric is appropriate and the readers are willing to drop personal scoring or grading criteria and apply the rubric, there should be a very high degree of agreement among independent scorers. Taking this extra step will improve the reliability of your assessment.

If you have questions about any of the above comments or your plans for 2011-12 assessment work, please don't hesitate to drop me a line or give me a call.

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Sources

 09-10 EREDept_AssessmentReport final-2

 2009-10 Env Res Engr feedback assmt rpt

 Academic Assessment Report Template

 ERE_writing_plan