Writing Communication: Assessing Both Students and Programs

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Abstract

Engineering programs must demonstrate that their graduates have an ability to communicate effectively. Assessment of this outcome occurs at two levels: assessing students' writing abilities and assessing a program's effectiveness in developing their abilities. The paper gives an overview of the two forms of assessment and gives examples of each. The paper then advocates assessment tools that can serve for both student assessment (grading) and program assessment. The most effective grading tools are those that emphasize clearly defined writing objectives, substantially improve student writing, and permit the evaluation of a program's effectiveness in achieving this improvement. The key to assessing something as subjective as “good writing" is a set of detailed writing expectations. These expectations should be developed by the program, with their implementation divided among those courses which have been assigned a writing component. The paper give examples of such expectations, which are termed “grade descriptors," in course writing assignments. Clearly defined expectations provide students with clear writing objectives and make grading papers far easier than with a more subjective, heuristic grading approach. More importantly, however, these expectations can become a means of improving student writing while assessing both students and programs.

INTRODUCTION

This paper advocates an assessment system for student writing within engineering programs. The assessment system is focused on the student-faculty relationship. The system requires that a program clearly articulate detailed outcomes for student writing and then assess these outcomes with two preferred assessment tools: the grading of course writing assignments and the review of cumulative portfolios. The paper begins by identifying the various assessment processes that can be applied to engineering students, faculty, and programs. A hierarchy of assessment tools are then considered for both students and programs, and the preferred tools are identified. The author then advocates the adoption of clear and detailed program outcomes for writing and gives examples of such writing outcomes. Finally, the author advocates methods for applying the tools to the outcomes by using course assignments and cumulative portfolios.

Table 1. Assessment processes

Level I	Students assess themselves • journals, drafting, course self–evaluations • peer review, reviews by a school's writing center
Level II	Faculty assess students • graded assignments and portfolios • ungraded drafts
Level III	Students assess faculty • course evaluations • exit (or periodic) interviews
Level IV	Faculty assess themselves • annual self–evaluations and performance reviews • portfolio assessments • course assessments
Level V	Programs assess themselves • the ABET self–assessment process • regional accreditation self–assessment processes • internal self–assessments
Level VI	ABET assesses programs

WHO'S ASSESSING WHOM?

Although relatively new to engineering, assessment models have formed the basis for management and education theory and practice over the past decade. For example, most states now regularly assess their primary and secondary schools and publicly issue “report cards" on their assessed performance. Many regional college accrediting bodies had already adopted assessment language before the Accreditation Board for Engineering and Technology (ABET) implemented its current assessment–based accreditation process.

Confusion can, therefore, arise within an institution, or even within a department, over the term “assessment" being applied in different ways to the evaluation of students, faculty, and programs. Indeed, the current ABET Criteria 2000 is, itself, the result of an assessment process among ABET and its affiliate members on how best to improve, evaluate, and accredit engineering education [1].

Table 1 lists the many assessment processes that can occur within an engineering education program. A particular, although perhaps unconventional, hierarchy was chosen in assembling this list: processes are listed in the order of student - faculty - program. Processes at the top of the hierarchy (Levels I and II) are more immediately and closely related to student learning and the achievement of intended educational outcomes. This hierarchy is also roughly related to the frequency of assessment, which ranges from the weekly evaluation of students to six–year ABET evaluations. Processes near the top of the hierarchy should form the foundation of a program's ABET assessment scheme, and the other assessment processes should be based upon the results of these higher–level, student–oriented assessments. Although faculty and administrators must eventually craft a six–year case for accreditation (Level VI), its success depends upon whether student improvement can be evaluated, achieved, and documented, perhaps on a weekly basis.

ASSESSMENT TOOLS

ABET requires that engineering programs establish learning objectives and outcomes and that they measure their achievement [1]. These measurements or “assessment tools" provide the documented evidence of outcomes achievement, particularly in regard to the evaluation of programs and students (Levels II, IV, V, and VI).

A number of possible assessment tools are listed in Table 2. A particular hierarchy has also been applied to the items in this table. Assessment tools at the top of the hierarchy provide the most immediate feedback on student success and instructional effectiveness. These tools are also primarily internal to the school and occur as part of the student–faculty relationship. At the bottom of the hierarchy are tools that provide longer term feedback and are largely external in application. Much of this evidence will likely be anecdotal. For example, alumni surveys will likely gain a response from just a portion of alumni, whose input will include only the most memorable strengths and deficiencies of their undergraduate program. Among all of the survey responses, perhaps just a few comments might be specifically related to writing instruction, and only a few of these might be useful in making program improvements. This is not to say that alumni and employer surveys are of no use as assessment tools, as poor results should prompt immediate program remedies. But, in the usual case, it is unlikely that such surveys will provide useful guidance toward making year–to–year instructional improvements. Other assessment tools, which lie in the middle of the Table 2 hierarchy, are also deficient in providing the sort of information that can lead to immediate program improvements. Some of these tools are discussed below.

The author advocates course–work (e.g., writing assignments) and portfolios (i.e., collections of student writing) as the primary tools for assessing both students and programs with respect to writing outcomes. Assessment founded on these two tools offer the following advantages:

Table 2. Program assessment tools

1. Course–work
2. Portfolios
3. Student self–assessments
4. Student course evaluations
5. Faculty self–evaluations
6. Exit interviews
7. Freshman and graduate writing tests
8. National exams: F.E., G.R.E., etc.
9. Placement data
10. Employer surveys
11. Alumni surveys

1. The assessment is based on “authentic" samples of the students' writing [2, 3]. Modern writing pedagogy is based upon the view of writing as a process, rather than an end result. Students improve their writing through a process of outlining, drafting, editing, and redrafting. This instructional approach is an authentic representation of how writing is done

in the engineering and business world. Assessment tools based on in–class essays, such as item 7 in Table 2, “short circuit" the planning and editing processes that are the habits of good writers.

2. The assessment is based on writing samples that the students take seriously, and assessment is reliable only when the students are serious about the assessment tool [4]. The results of other assessment tools, such as in-class essays for “benchmarking" purposes or even alumni and employer surveys, may not be given as much thought as graded writing assignments (or, for that matter, a pivotal business correspondence).
3. The assessment can have the greatest and most immediate impact on course delivery and curriculum improvement - instructors or entire departments can adjust their courses in a timely and informed manner in response to the results of graded course work. Although post–graduation surveys or exit interviews may turn up anecdotal evidence of writing deficiencies, such evidence may be distantly removed from the current instructional practice (e.g., new instructors, teaching methods, or entire curricula).
4. The assessment places responsibility on those instructors who teach writing to effectively improve the students' writing abilities. Moreover, when course–work and portfolio assessment are conducted by engineering faculty, it also places responsibility on the “assignment giver" to also become the “assignment instructor," rather than simply relegating writing instruction to external departments or units as “service" courses.

In short, course writing samples provide the most authentic evidence of effective writing instruction and student writing proficiency.

PROGRAM OUTCOMES FOR WRITING

Another advantage of course–work and portfolio assessment is that student learning and program effectiveness can be directly measured against a detailed articulation of the intended outcomes for student writing. If the assessment then uncovers problems, the deficiencies can be more readily isolated and remedied.

Scott and Plumb [3] have expressed the difficulty in formulating a consensus on what constitutes “good engineering writing." This may be particularly difficult for engineering instructors, who may have no formal training in technical writing theory and pedagogy. Moreover, conventions of “good writing" will differ among engineering disciplines and among the many business relationships that may exist between a reader and writer.

Table 3 shows a set of student writing outcomes for a civil engineering program. The table is sufficiently detailed so that its items can be parsed to individual courses, where they can then be taught and assessed. With this approach, good writing can be developed and reinforced across the curriculum, and no single course bears the entire responsible for achieving the itemized outcomes.

Table 3. Student writing outcomes

Audience analysis

- can distinguish between the different writing styles appropriate for the student–teacher relationship and the engineer-client relationship
- can present technical information and analysis to a non–technical reader
- can recognize terms and concepts that require definition or explanation to a less–technical reader
- can adopt a proper level of detail to suit the reader
- can analyze client needs in preparing a consulting report and a solicited engineering proposal

Organization

- General
  - can present ideas that are logically organized
  - can organize writing material into each of five categories: introduction, background, methods, results, and conclusions, discussion, and/or recommendations
- Introductions
  - can clearly describe the purpose of the work
  - can clearly describe the writer's relation to the work
  - can outline (in full sentences) the content of the writing
  - can identify and clearly describe the scope of a project
- Background information
  - can identify and present background information that clarifies the remainder of the writing
  - can identify and present the broader context of immediate technical issues
- Methods
  - can present methods with clarity
  - can explain why the methods were chosen
  - can present methods with an appropriate level of generality or detail for the intended readers
  - can present methodologies in a manner that clarifies and provides a context for the results
  - when appropriate, can reference published procedures
- Results
  - can present results with clarity
  - can use tables and figures to effectively present results
  - can present numerical results with an appropriate number of digits
  - can distinguish between results and conclusions

Table 3, continued

- Conclusions, discussion, and/or recommendations (CDR's)
  - can clearly present CDR's
  - can write CDR's that are supported by the writer's methods and results
  - can avoid speculation
  - can present CDR's that stay within the scope of a project

- Proposals:
  - can identify and clearly describe a scope of work
  - can effectively present qualifications without bombast
- Executive summaries: can write a clear and organized executive summary of an engineering report or laboratory report
- Paragraphs: can write organized and coherent paragraphs, each with a central theme

Style

- when appropriate, can write in a direct and concise style by
  - avoiding excessive use of the passive voice
  - focusing on the real subject and verb
  - avoiding expletives
  - avoiding excessively ornate language
  - avoiding unnecessary qualifiers
- when appropriate, can write clearly and precisely by
  - avoiding vague and omnibus words
  - avoiding vague pronoun references
  - defining abbreviations
  - avoiding verbs as modifiers
  - avoiding jargon and cliches
- can avoid long, garbled sentences
- can avoid a choppy, telegraphic style

Mechanics and usage

- can consistently write proper sentences
- can recognize commonly misused words
- can demonstrate proper punctuation
- can demonstrate proper parallel constructions
- can demonstrate consistent subject–verb agreement
- can recognize and consistently use a proper verb tense

Layout

- can use conventional formats for letters, memorandums, reports, and proposals
- can compose clear charts and tables that conform to standard technical conventions
- can properly reference tables and figures

Table 3, continued

- can properly cite references and format bibliographic entries
- can demonstrate proper layout of a title page and a table of contents

ACHIEVING AND ASSESSING WRITING OUTCOMES

In a previous section, the author advocated course–work and portfolios as the primary assessment tools. Course–work provides authentic “snapshots" of a student's writing ability; whereas, writing portfolios provide evidence of progress and improvement.

Student Course–Work

When a program adopts the use of writing assignments as a means of measuring their students'

ability and their own teaching effectiveness, the faculty takes responsibility for improving their students' writing. For example, if the final draft of an assigned report is chosen as a program assessment tool, the instructor has a direct interest in its outcome and will likely discuss the assignment with the students, articulate the intended outcomes, and promote a writing process that helps to perfect the final draft. The intended outcomes for this writing assignment can be taken directly from the program's writing objectives (Table 3).

The author's school has recently emphasized the use of “grade descriptors" for all assignments, including writing assignments: descriptions of the quality of work required for each letter grade. An example of such grade descriptors is shown in Table 4. These particular descriptors are for a written letter assignment and are focused on the letter's introduction and recommendations, as well as on certain stylistic elements. At the beginning of each writing assignment, the author gives his students the grade descriptors for that assignment, which then serve as the grading template. These descriptors can then be used by the students for both peer and self assessment. The descriptors can also be used by the school's writing center, to assist in focusing on particular writing elements. Such clearly defined expectations provide students with clear writing objectives and make grading papers far easier than with a more subjective, heuristic grading approach. The students' course–work provides the instructor with immediate feedback of whether the students have comprehended and fulfilled the objectives of that assignment.

Portfolios

In her excellent book on writing portfolios, Vaught-Alexander describes their value and use in improving and assessing student writing [5]. Portfolios can be assembled from the assignments of a single course or from student writing over an entire four year program. Portfolios are, perhaps, similar to the course–work files that were once assembled for ABET accreditation teams under the previous guidelines. Unlike accreditation files, however, the use of writing portfolios can be entirely internal. When periodically reviewed by faculty teams, they can provide valuable guidance toward improving writing instruction. They can also serve to bring a faculty together in the common goal of achieving its writing objectives.

Table 4. Example grade descriptors for a letter writing assignment

A	Your introductory paragraph(s) clearly describe: the purpose of the letter the purpose of the client's project your association with the project an outline of the intended coverage of the letter Your background information, methods, and results are clearly presented Your recommendations are clearly presented carefully explained directly supported by your work Your writing is direct and concise, by avoiding use of the passive voice avoiding expletive
B	Few (and minor) exceptions to the above

C	Few (but major) exceptions to the above
D	Major exceptions to the above
F	Many and major exceptions to the above

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