CHAPTER 5
GUIDING PRINCIPLES IN ENGINEERING WRITING
ASSESSMENT:
CONTEXT, COLLABORATION, AND OWNERSHIP

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Several years ago, one of the authors of this chapter was privy to details of a large-scale writing assessment of junior high students. The students had been given a brief prompt asking them to think through how watching television affects people’s thinking styles. One of the students involved in the assessment had approached the task creatively, beginning his essay as one would a television commercial and echoing that tone, complete with channel changes and other fragmenting interruptions. He began his essay this way: “Hi there! Television has not affected my mind...” and then proceeded to show, in a sophisticated demonstration of self-satire, how television had indeed fragmented his mind. Most of the evaluators participating in the assessment were impressed at the level of thinking, awareness, and creativity that went into the student’s writing sample.

However, one of the evaluators—a prominent state politician—was not at all impressed. This evaluator read the student’s essay, shook his head, and tsk-tsked. “That’s too bad,” he said, putting the essay down. The same essay that earned accolades from most of the English teachers and faculty evaluators was, in his mind, a disaster. Instead, he had found the essay’s unconventional approach and sentence fragments distracting and inappropriate.

This vignette illustrates what might be called a “paradigm clash.” In her book on the history and theories of writing assessment, Patricia Lynne (referring to the work of Thomas Kuhn) defines a paradigm as a concept “indicating a set of common models, values, commitments, and symbolic exchanges that unite disciplinary communities” (Lynne, 2004, p. 5). Paradigms are important because they allow disciplinary communities to have a common set of assumptions, a “knowledge base” that is shared. A paradigm clash, therefore, occurs when two communities operating under different paradigms meet on the terrain of ideas, definitions, or approaches. The vignette exemplifies a paradigm clash in that the politician held certain assumptions about what “good writing” looks like—formal in tone, grammatically clean, organized in a linear fashion—while the educators valued writing in terms of unique expression of thought, risk-taking, the ability to mock conventions appropriately, and an awareness of multiple forms or rhetorical strategies. The paradigms each group operated under reflected different sets of assumptions and values. Such clashes often have very real-world consequences: this mixed group had to reach some sort of consensus about
the student's performance, and about the message he would receive that day defining "good writing."

Lynne is particularly interested in the clash that occurs between composition instructors and theorists—those who teach writing, and analyze the teaching of writing—and measurement specialists—those tasked with the challenge of assessing student performance in writing. Composition instructors and theorists, argues Lynne, are often trained to see writing as contextual, constructed by the social relationships and/or events that give rise to the writing act itself—a paradigm often referred to as "social constructionism." For this group, good assessments measure writing within the context that produced it (i.e., at the programmatic or departmental level). Measurement experts, on the other hand, are more guided by concerns of "validity" and "reliability" in their efforts to make assessments fair and consistent, often because they are performing larger-scale assessments and may be responsible to stakeholders at institutional or governmental levels. Lynne recognizes that such characterizations oversimplify these two disciplinary communities, but suggests that they can nonetheless help us to understand how these two groups speak, or do not speak, effectively to one another.

This chapter represents our effort to reveal our own assumptions about writing assessment in an effort to reach out across groups concerned with assessment—both to those who teach writing and assess it at the local level and to researchers charged with assessing writing within an institutional context. We are keenly aware, as is Lynne, of the need for effective and appropriate writing assessment. Furthermore, we understand that there are occasions when objectivist data and analyses are necessary in the institutional settings of higher education. Our goal, therefore, is to think through how we, as composition instructors and theorists, can guide good, appropriate assessments of writing while still providing useful information and data for institutional decision makers. Below, we present a series of five guiding principles for writing assessment, which have developed out of what has worked (and not worked) at our own institution. To put it another way, we want to offer suggestions for how different stakeholders—like the English teachers and the state politician in our opening example—talk to one another about and value writing. We take this localized approach, in part, because we believe the most effective writing assessments meaningfully integrate, among other stakeholders, local actors.

Background

Measurement specialists, composition instructors, and theorists alike can agree that understanding context is key to developing appropriate assessment tools. Specific measurements used at a state-sponsored, research-intensive university enrolling 25,000 students may not necessarily work at a private liberal arts college enrolling 700. We realize that the experiences we write about below may be unique to our institution: the Colorado School of Mines (CSM) is a public university with "enterprise" status, which provides certain freedoms within the constraints of the publicly mandated university; its focus is on science and engineering education; and it is home to approximately 3,500 undergraduate and 1,000 graduate students. In other words, the kinds of writing assessments we perform are going to be specific to the needs of our particular student and faculty populations and informed by employer, taxpayer, and other stakeholder expectations. That said, we believe that while our specific stories are unique, the guiding principles below are judiciously generalizable and can be used to guide writing assessment at any institution. The examples we use may provide special insights to measurement specialists working with science and engineering populations, but the principles themselves are supported by research from multiple contexts and experiences.

Engineering and science universities operate within a specific assessment context that to some extent, defines who our stakeholders are and sometimes mandates or drives the kinds of assessment we do. In a chapter for an AIR volume on assessment practices in engineering and science universities in general, Olds describes this context in detail (Olds, 2008). For the purposes of this chapter on writing assessment, however, it is perhaps most important to understand that CSM has been grappling with outcomes-based assessment for 20 years, as a result first of a state mandate and then a shift in Accreditation Board of Engineering and Technology (ABET) assessment guidelines. As a result, some outcomes-based assessment practices at CSM are well established, others have been tried and revised or even abandoned, and still others are nascent. Engineering educators are still grappling with how to develop effective, sustainable assessment strategies given this developing context (Leydens & Santi, 2006; Olds & Miller, 1998; Shuman et al., 2000).

One significant constraint that affects writing instruction and assessment in engineering and science education has to do with credit hours. According to the 2004 National Academy of Engineering report, The Engineer of 2020: Visions of Engineering in the New Century, the average engineering student already takes on 10% more coursework than undergraduates in other fields and takes 4.8 years to complete the degree. In practical terms, this means that those of us who work in humanities and social sciences (including composition) face fierce competition for credit hours. The credit-hour difficulty has significance for those who organize required writing courses, writing- or communication-across-the-curriculum initiatives, and the assessment practices that accompany all writing activities. In some areas, we see possibilities for innovation; in others, difficult constraints.

All of this is to say that we know there is no "ideal" environment in which writing assessment occurs. Every context will have its opportunities and limitations. However, this fact makes it even more important to be guided by a series of principles for assessment, principles supported by theory and practice. Because the stakeholders in assessments are numerous and varied, because the pressures and the stakes are high, as evaluators of student writing, it is imperative that we keep some sort of North Star above us, to give us direction when we get distracted, hijacked, or lost. Our North Star(s), or guiding principles, are described in the next section. Although there is necessarily some overlap among them, together they constitute a theory of writing assessment that we hope will find common points of departure across the composition and measurement paradigms.
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Setting the Compass: Guiding Principles for Writing Assessment

In planning this chapter, we carefully considered our local practices of writing instruction and assessment. We wanted our writing on this subject to reflect our experiences, not merely dictate some abstract theory. Our first exercise together was, in fact, to construct the list of guiding principles below based on our experiences. It is worth noting, however, that many of our guiding principles echo those developed by groups such as the International Reading Association and the National Council of Teachers of English (Standards for the Assessment of Reading and Writing, 1994), the American Association for Higher Education (Nine Principles of Good Practice for Assessing Student Learning, 1996), and the Conference on College Composition and Communication (Writing Assessment: A Position Statement, 2006). They are also supported by recent research in composition and rhetoric studies.

Guiding Principle 1: People most support what they help to create.

We are all familiar with failed educational initiatives or assessments that were developed with the best of intentions but that failed to work "on the ground." Perhaps the developers of those initiatives did not have a good sense of local realities; perhaps political or personal values clashed and stakeholders withdrew; perhaps funding or other resources were inadequate to appropriately carry out the tasks required for the initiative to be successful. Guiding Principle 1 suggests that assessments that begin "on the ground" have a better chance of success than those that do not begin there; effective, appropriate, sustainable writing assessments are most frequently supported by "buy-in," commitment to success from those most directly affected by the assessment: students and writing instructors and theorists.

In his book What We Really Value: Beyond Rubrics in Teaching and Assessing Writing (2003), Bob Broad describes one method for developing assessment at the ground level. Broad studied a portfolio assessment process at "City University," a process that, surprisingly, was not informed by the use of rubrics. Broad, in fact, takes issue with most writing assessment rubrics in use today, arguing that "traditional rubrics and scoring guides prevent us from telling the truth about what we believe, what we teach, and what we value in composition courses and programs" (Broad, 2003, p. 2). This is because rubrics are often developed by administrators and are effectively "normative" and "formative," but are not adequately "descriptive" or "informative" (p. 2). Broad argues that, instead of using rubrics, writing programs might adopt a process that he calls "Dynamic Criteria Mapping" (DCM) to identify what they "really value" in student writing.

DCM is a process wherein an outside observer studies the evaluative language and criteria that an assessment group uses as they evaluate student writing. Mapping this language-employed in the absence of a rubric-reveals important details about what writing assessors really value in student writing. The observer analyzes the transcripts of assessment sessions in order to develop this "map," which may reveal assessment strategies or values that are not adequately represented or explicitly defined in programmatic objectives or mission statements. For example, at City University, DCM revealed that writing instructors penalized students for writing about an implicit list of "Terrible Topics," topics that instructors saw repeatedly and found boring or amateurish. Broad writes,

The gravity and complexity of Terrible Topics in the evaluative dynamics of this writing program call for open discussion of the issue among instructor-evaluators in an attempt to set program policy and, at the very least, for instructors to inform students of the Ten Terrible Topics so they can choose topics knowing the relative risks associated with them. (p. 69)

DCM is most effective, in other words, because it emanates from actual assessment practice and provides students with a clearer picture of how their work is actually evaluated. Programs and departments can use DCM results to then review stated objectives, mission statements, assignments, or assessment practices.

Unlike Broad, we find that one positive outcome of the DCM process is rubrics that have been developed collaboratively by key stakeholders and informed by their explicit and implicit values. We have included in our appendices examples of locally developed and supported rubrics that have worked well in our institutional context. But we are excited by the potential of DCM to reveal assessment values, and we support the development of DCM at the local level.

Guiding Principle 1 and the practice of DCM are driving forces behind a new Portfolio Project initiative at CSM. Co-author Schneider coordinates a first-year required writing course entitled Nature and Human Values (NHV). To better assess student learning and writing improvement over time, the NHV faculty, with input from stakeholders such as technical CSW faculty, students, and administrators, will be developing a portfolio assessment tool. Substantial research exists on the use of portfolios (Broad, 2003; Elbow, 2006; White, 1994, 2005; Yancey & Huot, 1997), and it would have been possible for the course coordinator to develop a portfolio assessment system, introduce that system to the faculty as a fait accompli, and have seemingly acceptable levels of reliability and validity. But the process would suffer from little faculty buy-in (the faculty did not, after all, have input throughout the process), and there might be even less student buy-in (we might not tell them what we value in the assessment, how we determine those values, or what we do with the assessment). In short, the project could have a short life-span or, in the final analysis, be inappropriate to what it is we are truly trying to measure.

In engineering education, the shift to outcomes assessment has been shaped by the revision in ABET criteria; however, it is possible to use this external, or top-down, impetus as a means of propelling bottom-up assessment design. In NHV, we will work together as a team to identify key stakeholders and to determine what levels of expertise and commitment those stakeholders have in the design of the portfolio system. Looking at course objectives and other key institutional and program documents (mission and vision statements, for example), the key stakeholder group will design an assessment that incorporates multiple stakeholder perspectives and that makes sense given the context and objectives of the course, testing and revising the assessment over several years. Our hope is that in developing the assessment
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this way, our work will look something like Broad's DCM process, in which the stakeholders take ownership of the assessment, modifying it where appropriate, gaining value from the design process and the outcome, and using the outcome to gain understanding about student writing, the course, teaching and learning, and their own standards of evaluation. Initially, this investment in bottom-up assessment design will be more time- and resource-intensive than a top-down initiative, but we are convinced the rewards will be greater in the long run. Top-down initiatives may be appropriately valid and reliable, but if there is no "buy-in," the "meaningfulness" of the assessment, to use Lynne's term, will be compromised, and the assessment will probably not be appropriate or sustainable in the long run (Huot, 2002; Lynne, 2004). By contrast, a bottom-up process more readily lends itself to the meaningful integration of assessment findings that inform teaching and learning.

**Implementing Guiding Principle 1**

Identify key stakeholders in the assessment process and work with them to develop meaningful assessments. Strive for a win-win outcome.

Guiding Principle 2: We assess most effectively what we value most.

When people have a stake in the outcome of assessment, they are more likely to value the assessment results. In an important assessment text, Huot (2002) argues that what matters most to writing faculty generally is assessment results that foster better teaching and learning, which is a primary value (if not the primary value) among composition faculty. He calls assessment "a direct representation of what we value and how we assign that value," adding that "it says much about our identities as teachers, researchers, and theorists" (p. 11).

Occasionally, we are not sure what we do value, or find that our values work implicitly, rather than explicitly, to shape our assessment strategies. As was the case in Broad’s study of City University, our tacit values may contradict our explicitly stated goals and objectives. Often, figuring out "what we really value" is a key first step in designing or revising assessments that work. Assessments occur at multiple levels—institutional, programmatic, classroom, and others—and one classroom example can help illustrate the process of discovering what learning objectives and corresponding assessments one values most (Leydens & Santi, 2006). A CSM colleague participated in a Writing Across the Curriculum (WAC) workshop to more effectively integrate writing into a geological engineering course for upper division undergraduates and graduate students. Having taught the course several times already, he began the revision process by more explicitly connecting students’ learning difficulties with his course objectives and assignments, so the assignments directly addressed their struggles and thus helped them meet key course objectives. For him, the act of writing out his students' learning difficulties led to a discovery of what he valued most in those assignments; he was also assisted in this regard by two other acts: writing assignment rubrics and creating write-to-learn prompts.

The act of articulating performance criteria in assignment rubrics helped render explicit not only how students would be evaluated but also the (previously more tacit) criteria the instructor held of highest value. In other words, this instructor’s review of his own instructional practices led him to develop rubrics that explicitly stated what he “really valued.” Although Broad cautions against the use of rubrics, we believe this is an example in which the instructor used the rubrics to identify and more effectively communicate his assessment values to his students, which led to improved student performance.

Perhaps the most helpful assessment tool was—paradoxically, for some—an assignment he never formally graded. Write-to-learn prompts are informal, generally ungraded writing assignments that serve to help students write to discover rather than write to communicate what they already know. Our colleague carefully examined what conceptual difficulties students typically encountered and turned these into in-class writing prompts. For instance, in a structural geology report, students typically depended excessively on maps, so he asked them to write for three minutes on what lab and drilling data suggested that cannot be construed from mapping alone. Thus, he began the process of composing write-to-learn activities by reviewing student misconceptions or incomplete understandings and creating focused write-to-learn prompts to address these; he then evaluated the learning success as students translated such insights into their geology reports. Initial data suggest important improvements in student performance when comparing students who did and did not use write-to-learn prompts. To summarize, what learning outcomes our colleague most valued came more fully into view by examining assignments in light of course objectives and common student difficulties, articulating assignment criteria in written rubrics, and aligning both ungraded and formal assignments to address student learning struggles (Leydens & Santi, 2006).

We realize these examples occur at the classroom and programmatic level rather than at the institutional level, which is perhaps of most concern for readers of this chapter. We would argue, however, that the best assessments at any level are localized to particular contexts. Barlow, Liparulo, and Reynolds (2007), writing about an assessment process at the University of Houston, provide three "lessons learned" from their efforts: "stakeholders must be included, design must emerge (rather than being pre-defined), and the study must be formative rather than summative" (p. 52). The authors of the assessment note that they were very invested in involving local stakeholders in the assessment process, because it is important for establishing validity, but also "it makes good political sense if you want your findings to lead to change" (p. 46). The success of locally grown, program-level assessment is supported by research and theory (Anson, 2006; Huot, 2002; Lynne, 2004; Olds & Miller, 1998).

**Implementing Guiding Principle 2**

With your assessment team, first work to define what you value and then develop methods that will assess those values.
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We realize these examples occur at the classroom and programmatic level rather than at the institutional level, which is perhaps of most concern for readers of this chapter. We would argue, however, that the best assessments at any level are localized to particular contexts. Barlow, Liparulo, and Reynolds (2007), writing about an assessment process at the University of Houston, provide three “lessons learned” from their efforts: “stakeholders must be included, design must emerge (rather than being pre-defined), and the study must be formative rather than summative” (p. 52). The authors of the assessment note that they were very invested in involving local stakeholders in the assessment process, because it is important for establishing validity, but also “it makes good political sense if you want your findings to lead to change” (p. 46). The success of locally grown, program-level assessment is supported by research and theory (Anson, 2006; Huot, 2002; Lynne, 2004; Olds & Miller, 1998).

Implementing Guiding Principle 2

With your assessment team, first work to define what you value and then develop methods that will assess those values.
Guiding Principle 3: Assessment is not something done to us, but something we do to deepen our own knowledge and practice.

The value of assessment findings lies in their ability to transform practice. Assessment should be used not only to assess student learning, but to facilitate it. Portfolios, for example, can be as useful for students in assessing their own learning as they are for instructors or administrators. In “The Scoring of Writing Portfolios: Phase 2,” Edward M. White (2005) argues that the self-reflective cover letters students draft for inclusion with their portfolios should function as both an assessment and a learning tool: “When a student introduces a portfolio with serious reflection about it, the student is taking responsibility for the quality of the work, the choices that were involved in the writing, and the learning that occurred—or not occurred. It is a powerful metacognitive act…” (White, 2005, p. 583). The portfolio, then, becomes not simply a way to evaluate student writing, but to propel student learning.

The idea behind Guiding Principle 3 is, in fact, also a driving force behind Brian Huot’s (Re)Articulating Writing Assessment for Teaching and Learning (2002). Huot argues that writing assessment is an opportunity for “progressive social action” that should not reinforce or hold up accepted power relations and class systems, but seek to question them via teaching and learning practices. Huot’s implicit argument is that practice and assessment are ideally mutually shaping factors—practice should shape assessment and assessment should shape practice. Assessments that are driven by teaching and learning and that, in turn, inform teaching and learning are going to be most valuable.

An example from CSM’s Chemical Engineering department illustrates this Guiding Principle. At CSM, each undergraduate engineering program includes a three- to six-week summer field session to help students acquire more hands-on practice in their chosen discipline. In chemical engineering, the junior-level field session is used to teach unit operations laboratory, a traditional lab experience involving large-scale (at least for academic institutions) process equipment that students are likely to encounter in chemical process plants when they graduate.

Since the chemical engineering program’s inception in the 1950s, the unit operations laboratory has been viewed by the faculty as an ideal context for helping students become better engineering practitioners. This goal is achieved by enhancing students’ higher-order thinking skills and familiarity with many aspects of chemical engineering professional practice, including data collection and experimental design; statistical analysis of experimental data; data evaluation and interpretation of results; identification and analysis of accepted empirical models and of potential hazardous equipment operations; and effective oral, written, and graphic communications.

In its original format, the course required students to present their results for half of the experiments orally and half using written reports. No formal communications instruction and little feedback was provided to students during the six-week term. Not surprisingly, growth in writing quality was minimal. Based on feedback from constituents, the chemical engineering faculty in 1989 decided the laboratory course had to be revamped with explicit instruction and practice in oral and written communications so that students’ skills would be adequate upon graduation. After rich deliberations with a campus technical communications expert in the process of course revisions, several course improvements emerged that focused on writing instruction and practice:

• Inclusion of two 3-hour writing workshops to review writing fundamentals and report requirements;
• Conversion of report preparation to a process involving submission of drafts, review sessions with both chemical engineering and technical communication faculty members, and submission of revised reports for grading; and
• More emphasis on developing communication skills throughout the course, including lab notebook preparation, a pre-lab oral exam prior to entering the lab to ensure adequate preparation before experiments, and professionally-prepared graphics for both oral and written reports.

In addition to these course improvements, new ABET program-level assessment expectations in the mid-1990s resulted in use of the unit operations laboratory course as a primary location for assessing several student outcomes including:

• An ability to identify, formulate, and solve chemical engineering problems (addressing ABET outcomes 3a and 3e);
• An ability to design and conduct experiments and analyze and interpret data (addressing ABET outcome 3b); and
• An ability to communicate effectively (addressing ABET outcome 3g).

These outcomes are now successfully assessed using the rubric shown in Appendix A, which was originally developed for program-level assessment activities but is now also used to guide grading of individual student work in the course. The use of the rubric in this program is a good example of the ways in which assessment both drives and is driven by the need to improve teaching and learning.

### Implementing Guiding Principle 3

Develop assessment methods and instruments that you and other stakeholders can learn from, via both the process of designing them and implementing findings.

Guiding Principle 4: Contextualized, bottom-up, not top-down, approaches work best. Local knowledge about genres, rhetorical situations, assignment emphases, time constraints, and so on, should all play roles in the assessment process, so the best assessment procedures are ones grown by primary stakeholders and informed by institutional researchers. This key principle is clearly linked to Guiding Principle 1, but here we emphasize the importance of encouraging stakeholders to develop ownership of assessments—even when they are mandated from above—because they (the stakeholders) most clearly understand the particular practices and constraints of specific writing practices. Similarly, we encourage institutional researchers to offer
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This principle is closely correlated to the "social constructionist" paradigm of composition instructors and theorists, explained at the beginning of this chapter. Composition instructors and theorists "more readily accept the notion that knowledge—and by extension, writing—is socially constructed," writes Patricia Lynne (2004), "than that knowledge resides in material reality apart from human and linguistic perception or that knowledge is the property of the autonomous individual" (p. 120). Successful writers learn to write in different ways, using different voices and vocabularies, for different situations. How, what, and why we write is always dictated by a particular set of social, contextual circumstances.

This is a salient guiding principle for those teaching writing in engineering programs because so many of the writing practices students are engaged in are shaped by disciplinary conventions, many of which are often kept implicit rather than being made explicit or transparent to novice or apprentice writers. Nonetheless, engineering students must develop a solid understanding of audience expectations, of how to translate technical material for a variety of readers and purposes, and of the conventions of particular disciplines (a metallurgist, for example, will present his or her results differently than a geologist). This principle is also a central tenet of the WAC movement (Young & Fulwiler, 1986) and is supported by research in institutional assessment practices (Anson, 2006; Barlow et al., 2007; Hillocks, 2003).

Following this principle may mean that both composition instructors and theorists and measurement specialists occupy an advisory role in writing assessment as opposed to a leadership role. Another example from our university’s chemical engineering program illustrates how WAC administrators can support assessment that is organically developed and appropriate to the local context.

Traditionally, undergraduate engineering programs culminate in a senior-level design experience of one or two semesters. In the Chemical Engineering Department at CSM, this experience is encompassed in a one-semester course focused on designing large-scale chemical processes. The course has evolved over the last 10 years to include a heavy emphasis on the use of powerful simulation software (ASPEN Plus) with a corresponding decrease in hand calculations to estimate process operating conditions and equipment sizing. Software is also available to complete economic analyses of process profitability. As a result, student design teams now spend less time on routine, repetitive calculations and more time generating design alternatives and analyzing each in more detail (a key to identifying good engineering design choices).

However, with this increased power to analyze complex process alternatives comes the need for better written documentation throughout the design process. Design instructors recognized this need and, with input from campus writing faculty, included several new writing tools in the course. These included write-to-learn exercises and other assignments, including increased opportunities for feedback and revision.

In addition, the instructors soon realized that better assessment of summative documentation (i.e., a comprehensive final written report) was required both to assess students learning outcomes and to provide guidance to student teams about faculty expectations. Faculty from the design course and the Chemical Engineering Department Assessment Committee (formed in the late 1990s to respond to accreditation expectations for program-level outcomes assessment) met over a two-year period to iteratively develop a scoring rubric for use at the course level (student formative feedback and summative evaluation) and program level (outcomes assessment). The version now in use encompasses six outcomes and is shown in Appendix B.

A key revision to the rubric occurred after the assessment tool was first implemented. The version in Appendix B is modified from the original in that the first outcome involving engineering design has been subdivided into four sub-outcomes. This modification was made when both design faculty and assessment committee members realized that a single design outcome did not allow them to adequately assess each critical step in the engineering design process. The rubric, in other words, was not the assessment endpoint; faculty used their own expertise and actual student learning outcomes to revise the rubric over time, making it fit "what they really valued," as opposed to allowing it to dictate their values to them.

Overall, we estimate that approximately 250 person-hours of time were required to develop this rubric, but the effort was worthwhile given the rich discussions about department expectations for students. Since it helps assess changes over time in student learning, the rubric is now used as one of several key assessment tools for ongoing program assessment efforts in addition to its use in the process design class each academic year. It should be underscored that the rubric's effectiveness stems in part from its bottom-up creation, as it originated with course instructors and spread to the faculty within the department assessment committee.

Important corollary to Guiding Principle 4: Sometimes assessment, even specific assessments, are mandated.

The challenge, therefore, involves making what may be a top-down initiative (for example, an assessment mandated by an accrediting agency) develop into a bottom-up initiative, wherein local stakeholders, especially those most directly affected, play vital roles in the assessment design and implementation (White, 2005).

Implementing Guiding Principle 4

Welcome, value, and encourage involvement at the grassroots level.

Guiding Principle 5: Writing is a uniquely complex cognitive and social activity and presents unique assessment challenges.

Several years ago, one of our students submitted a paper for NHV (our first-year composition course firmly rooted in the humanities) that she had completed earlier for an introductory engineering design course. She deservedly received an "A" on the paper in the design course and a "C" for the paper in Nature and Human
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If good writing depends on an understanding of audience, purpose, topic, and context, good writing assessment should measure that understanding. According to Lynne (2004),

...contextual literacy attaches meaning in writing to the location and purpose of that writing, so contextual assessment would involve evaluating writing for its ability to respond to rhetorical situations. The paradigm also claims an integrated view of writing and consequently would encourage the assessment of whole writing tasks which treat literate ability as a situated act rather than as discrete skills or pieces of information, as would be preferred in a technocratic paradigm. (p. 127)

To understand the contextually situated nature of writing, it is vital to recognize that writing skills and rhetorical abilities develop slowly over time yet can atrophy rapidly through disuse (Lindemann, 1995). Furthermore, academic writing requires a level of sophistication and daring that must be tried on and wrestled with, and such daring will entail some amount of failure. As David Bartholomae (1985) puts it:

To speak with authority [students] have to speak not only in another’s voice but through another’s code; and they not only have to do this, they have to speak in the voice and through the codes of those of us with power and wisdom; and they not only have to do this, they have to do it before they know what they are doing, before they have a project to participate in, and before, at least in terms of our disciplines, they have anything to say. (p. 156)

Students, Bartholomae continues, “cannot sit through lectures and read textbooks and, as a consequence, write as sociologists or write literary criticism. There must be steps along the way” (p. 157). In other words, writing is something that must be practiced, practiced, and practiced some more, across a variety of contexts, for a variety of audiences and purposes, and at multiple junctures in a student’s process of learning. This practice, furthermore, must be sustained, or it will quickly atrophy. This fact could have particular significance for those working in science and engineering education, where the gaps in time between students’ writing or writing-intensive classes may be substantial as they pursue technical classes that do not incorporate communications instruction.

Given this reality—that writing ability develops in fits and starts over time, and is shaped by context—the assessment of writing can be challenging. This principle will require composition instructors and theorists and institutional researchers as assessment specialists to think creatively about writing assessment practices. As the vignette at the beginning of this chapter illustrated, writing skills and abilities are contextually defined. An assessment tool that looks only at grammar or mechanics, for example, provides a very limited angle of view; broader, more holistic approaches to assessment, on the other hand, help us to see writing ability as multi-faceted and complex (Moskal & Leydens, 2000; White, 1994).

Over the past several years, writing portfolios have deservedly become an accepted method of gathering and assessing student writing (and program goals, as we see in the case of Broad’s DCM), presumably because they allow for this more holistic view. Composition instructors and theorists are still thinking about best practices in portfolio assessment, but most agree that the concept itself, which works to assess “whole writing tasks,” is a step in the right direction (Lynne, 2004, p. 127). CSM’s own experiences with writing portfolios are illustrative of both the potential successes and drawbacks of such assessments.

In response to state-mandated requirements for assessment, CSM implemented its first portfolio program in 1989. The program took a statistically based random sampling of incoming first-year students each year, and as background gathered data such as SAT and ACT scores and GPAs. An institution-wide Assessment Committee then collected selective materials for the students’ first and second years; departments did their own assessments of junior- and senior-level work. The portfolios did not focus exclusively on writing, although writing assessment was a part of the program. The Assessment Committee, made up of faculty from across the disciplines at CSM, used the institution’s mission and Profile of the Future Graduate to develop a number of educational goals that the portfolios would help to assess. Using these goals as guidelines, the Committee established a matrix for assessing portfolio materials. For more specific information on what materials were included and on how they were assessed, see Olds and Pavelich (1996).

In many ways, this portfolio assessment, which ended several years ago, was successful. Although mandated, the specific assessment practices developed organically, with involvement from many faculty members (Guiding Principle 1). In accordance with Guiding Principle 3 above, it was used to provide feedback to departments and faculty members, who used the assessment to shape and revise teaching. For example, one department made changes in the types of writing it required of its students when it saw that students were only completing short, surface-level writing assignments. Another department revised the content of its test questions. Furthermore, the portfolio assessments allowed for complex analyses of student performance over time, and though their focus was not simply on writing assessment, they did lead to significant changes in the writing program at CSM, including the hiring of a Writing Program Administrator in 1997. Finally, analyses of students’ thinking abilities demonstrated growth in student learning as a result of curricular changes.

The shaping of the educational goals and the matrices for completing the assessment were in keeping with the ideal of an assessment that takes into account the situated performance of all student work, and allowed student work to emerge from within the contexts that gave rise to it, a practice supported by Guiding Principle 4.

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primarily to outside forces—in this case, the state agency that mandated the assessment in the first place. If we had this portfolio project to do over, we would have access to and take advantage of two main knowledge sources: what we learned from orchestrating the project and from new research on technology that facilitates portfolio assessment.

Important corollary to Guiding Principle 5: There is an inverse ratio between ease of assessment and value of result.

If writing is a complex activity, and if appropriate writing assessments allow for that complexity, it stands to reason that “easy” assessments—such as multiple-choice tests or measurements focusing only on grammar, for example—are not effective. Writing assessment, when done correctly, requires resources: financial, professional, and institutional. In the case of the CSM portfolio project discussed earlier, we underestimated the need for all three, and the project eventually collapsed under its own weight. Although the school’s administration was supportive of the portfolio project, very few financial resources were available to support it. In addition, with limited assessment expertise on the campus at that time, there was no plan for succession and thus, when the program developers left to assume other duties, enthusiasm for the process left with them. Finally, the Assessment Committee, which was responsible for the portfolio project, never gained status as an official university committee and, therefore, had no real power to enforce compliance.

Implementing Guiding Principle 5

Recognize that writing is a complex, situated activity, and design your assessment accordingly.

Conclusion

We believe that these five principles suggest important guidelines for developing successful, meaningful, and ethical writing assessments:

1. People most support what they help to create.
2. We assess most effectively what we value most.
3. Assessment is not something done to us, but something we do to deepen our own knowledge and practice.
4. Contextualized, bottom-up, not top-down, approaches work best.
5. Writing is a uniquely complex cognitive and social activity and presents unique assessment challenges.

We understand that it may often be easier to develop top-down strategies for assessment that rely on easy-to-evaluate criteria or testing mechanisms; our own experiences and research in composition practice and theory, however, suggests that the best assessment practices are developed organically, with buy-in from local stakeholders. They are appropriately complex—just as the act of writing is—and as a result often require time and resources to complete properly. But the outcomes for all involved when assessment is done well are sure to be positive. We believe that composition instructors and institutional researchers alike are most interested in understanding and improving student and faculty learning, and the principles listed above suggest how we might achieve this shared goal. On this common ground, we stand to address potential paradigm tensions and work toward meaningful assessments for a multitude of stakeholders.
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#### APPENDIX A: ChE Department
##### Scoring Rubric for Unit Operations Laboratory Reports

<table>
<thead>
<tr>
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<th>Proficient</th>
<th>Apprentice</th>
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<th>Score</th>
</tr>
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<tbody>
<tr>
<td>4.3) ChE graduates will be able to apply knowledge of unit operations to the identification, formulation, and solution of chemical engineering problems.</td>
<td>Student groups apply knowledge with virtually no conceptual or procedural errors affecting the quality of the experimental results.</td>
<td>Student groups apply knowledge with no significant conceptual errors and only minor procedural errors.</td>
<td>Student groups apply knowledge with occasional conceptual errors and only minor procedural errors.</td>
<td>Student groups make significant conceptual and/or procedural errors affecting the quality of the experimental results.</td>
<td></td>
</tr>
<tr>
<td>2.1 &amp; 2.2) ChE graduates will be able to design and conduct experiments of chemical engineering processes or systems and they will be able to analyze and interpret data from chemical engineering experiments.</td>
<td>Student groups design and conduct unit operations experiments with virtually no errors; analysis and interpretation of results meet requirements of experiment and demonstrate significant higher-order thinking ability.</td>
<td>Student groups design and conduct experiments with no significant errors; results are analyzed but not interpreted; very limited evidence of higher-order thinking ability.</td>
<td>Student groups design and conduct experiments with major conceptual and/or procedural errors; no evidence of significant analysis and interpretation of results; fail to meet requirements of the experiment; demonstrate only lower-level thinking ability.</td>
<td></td>
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</tr>
<tr>
<td>3.2) ChE graduates will demonstrate an ability to communicate effectively in writing.</td>
<td>Written report is virtually error-free, presents results and analysis logically, is well organized and easy to read, contains high quality graphics, and articulates interpretation of results beyond requirements of the experiment.</td>
<td>Written report presents results and analysis logically, is well organized and easy to read, contains high quality graphics, and articulates interpretation of results which meets requirements of the experiment.</td>
<td>Written report is generally well written but contains some grammatical, rhetorical and/or organizational errors; analysis of results is mentioned but not fully developed.</td>
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**Evaluator:** ___________________________  **Date:** ___________________________

#### APPENDIX B: ChE Department
##### Scoring Rubric for Senior Design Projects

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<tr>
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<td>2.3) ChE graduates will be able to design chemical engineering processes or systems which meet specified project requirements:</td>
<td>All important project objectives are identified.</td>
<td>Important objectives are identified but 1 or 2 minor ones are missing.</td>
<td>Most objectives are identified but at least 1 or 2 important ones are missing.</td>
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<td>a. identifying specific project objectives based on general project and client requirements</td>
<td>All relevant information is obtained and used to support design recommendations.</td>
<td>Sufficient information is obtained and used to support design recommendations.</td>
<td>Some information is obtained but more is needed to support design recommendations.</td>
<td>No significant background information is gathered.</td>
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</tr>
<tr>
<td>b. gathering and using relevant background information</td>
<td>Three or more alternative solutions are considered; each is correctly analyzed for technical feasibility.</td>
<td>At least 2 alternative solutions are considered; analysis is complete but contains minor procedural errors.</td>
<td>At least 2 alternative solutions are considered; analysis contains minor conceptual and/or procedural errors.</td>
<td>Only one solution is recommended; analysis does not apply all relevant chemical engineering knowledge.</td>
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<td>c. generating and analyzing alternative solutions by synthesizing and applying appropriate chemical engineering knowledge</td>
<td>Best solution is recommended based on stated criteria.</td>
<td>Reasonable solution is recommended; other alternatives should have been developed and analyzed.</td>
<td>Satisfactory solution is recommended; better solutions were available and should have been considered.</td>
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<td>d. choosing the optimal solution based on evaluation of technical and economic criteria.</td>
<td>Economic analysis is complete and correct; all relevant economic factors are considered.</td>
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