

Assessing Engineering and Technology Students' Abilities to "Communicate Effectively:" Overcoming Obstacles

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Abstract — Assessing students' communication abilities may prove challenging to faculty members in schools of engineering and technology. This piece discusses how faculty members at one institution designed a communication assessment process that took these challenges (lack of confidence, lack of time, and a lack of a perception of benefits) into account. Several of these principles may apply to other institutions as they design programmatic communication assessment.

Obstacles encountered in assessing communication abilities

Effective oral and written communication abilities – both visual and verbal – have long been essential to the effective functioning of engineers and engineering technologists in the workplace.¹ The Accrediting Board for Engineering and Technology (ABET) and other external forces have recently begun requiring schools of engineering & technology (E&T) to assess whether students can “communicate effectively” as an outcome of their educations.² Formally assessing those abilities as outcomes provides a relatively new challenge to many institutions.

When asked to assess their students' technical communication abilities, faculty members in schools of engineering and technology may feel hesitant about doing so for at least three reasons.

- E&T faculty members may perceive that technical knowledge is separable from the means used to communicate it³ and therefore believe that their expertise is primarily technical. Also, because many have not been well-trained in communication, they may lack confidence in their competence to assess students' communication abilities.
- Assessing students' written and oral artifacts can be complex and time-consuming, so faculty members may also perceive that they lack time for conducting such assessment well.
- E&T faculty members may believe that they will experience few rewards or benefits for the work involved in assessing students' communication abilities.

Several years ago, I began to contribute my expertise in technical communication to participate with faculty members at the Purdue School of Engineering and Technology at Indianapolis in assessing students' communication abilities. We took a different approach than that used by other technical and engineering schools in that we did not attempt to assess communication abilities within a portfolio of students' work,⁴ but rather to focus on assessing their abilities via artifacts that were produced in our technical communications classes.

Below, I discuss the following topics illustrated by how we have devised technical communication assessment procedures at the Purdue School of Engineering and Technology, Indianapolis over the past three years:

- how we enhanced E&T faculty members' confidence by training and using interdisciplinary teams of faculty members to design and conduct communication assessment
- how we dealt with time constraints by designing a process and an instrument that yielded useful results but did not consume inordinate amounts of faculty time.
- how we focused on the benefits that the process of designing and conducting communication assessment could yield to faculty members in their professional development as educators.
- how other schools of engineering and technology might design and conduct technical communication assessment while keeping in mind the reservations that faculty members may have about doing such assessment.

Before discussing these issues, however, I offer a brief description of the technical communication assessment process that we developed.

Designing an appropriate process for conducting communication assessment

When designing communication assessment, one needs to take into account the constraints and needs of the educational institution.⁵ In addition, those who teach the students should play an important role in assessing those students' communication abilities because faculty members know best how to interpret what their students are able to do. Localized assessment of communication can provide a "community of interpreters" with a "knowledge of that community" who can "assess fairly."⁶ The field of writing assessment especially has moved away from having "psychometric experts" test students and has moved towards having faculty assessing their own students' communication abilities.⁷

Because of the need for local development of assessment processes, during our pilot study year (academic year 1999-2000), we formed two teams each consisting of two faculty members from a specific discipline and one person representing technical

communication. At early meetings, we discussed our understandings of the features of effective engineering workplace communication. From these discussions, we generated a rating sheet, tested the rating sheet, revised it, and used it again to assess samples of workplace-type documents and speeches collected from students in technical communications courses. After this initial assessment, we again revised the rating sheets and used them to assess samples from spring technical communication classes. At that time, we “froze” the rating sheets so that we could gain comparable results across the years. (See Appendixes A and B for examples of the writing and the speaking rating sheets.)

These rating sheets were intended to provide overall rating scores for each artifact, a score that could be used to generate data useful for accrediting purposes. The sheets were also designed to highlight important features of effective communication. Data gathered from the ratings of these features were intended to be used by departments as they ascertained student areas of weakness; these areas could then receive particular attention in curricular revisions. These rating sheets do not use traditional assessment rubrics in which a definition of the quality of each item is listed because we found such defining would have made the instrument too cumbersome. However, both teams generated such definitions orally through our discussions before and after we assessed artifacts.

We based the design of the process on the assumption that we were assessing workplace communication abilities that students had developed throughout their entire course of study, not just in the technical communications classes.⁷ Although writing and speaking samples were taken from technical communications courses, the results were returned to the departments to use as a basis for curricular decision-making. We have expanded the process since the pilot study to enable representatives of all seven of our departments to be trained to assess student communication. (See Figure 1).

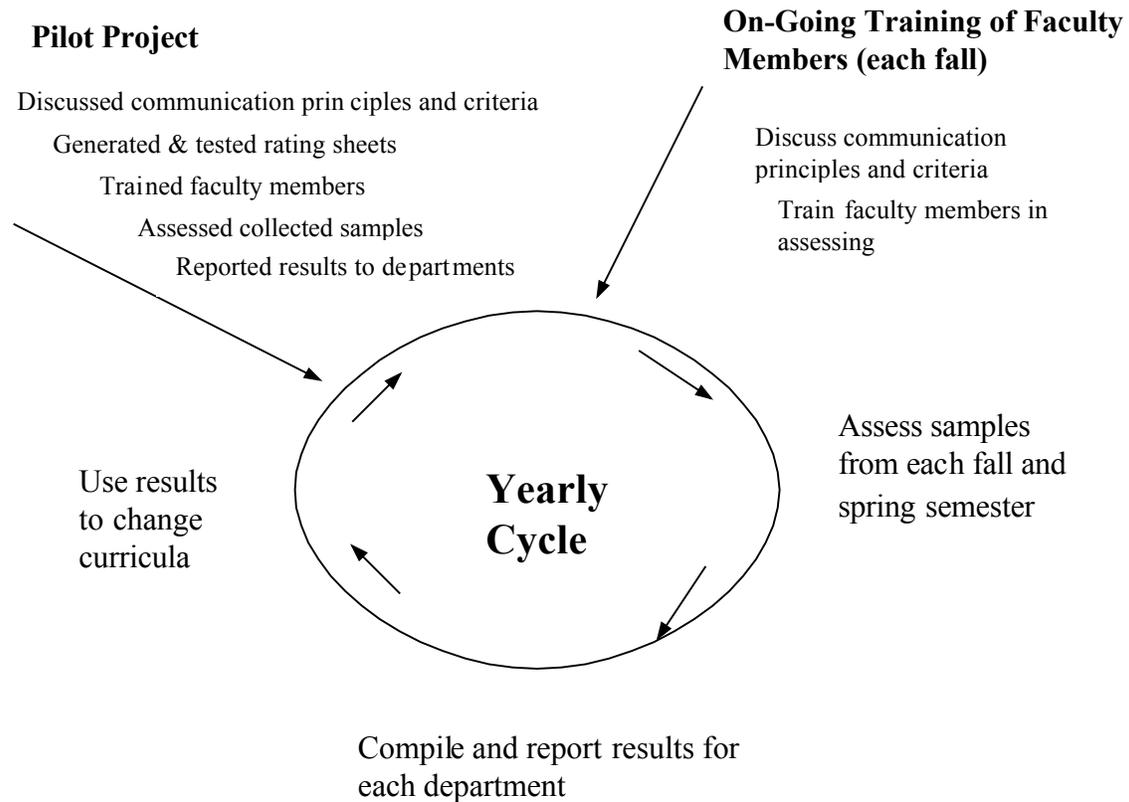


Figure 1. Communication Assessment Cycle at IUPUI's School of Engineering and Technology

Enhancing Faculty Members' Confidence in Assessing Student Communication Abilities

Several faculty members at our institution expressed a lack of confidence in their ability to conduct communication assessment because:

- As engineers and engineering technologists, some of them do not perceive their greatest strength to be in verbal arenas. They are more likely to be comfortable with thinking quantitatively and communicating with other specialists.
- Several of them speak English as a second (or third or fourth) language and are sometimes not sure of their command of the conventions of North American English.
- Many of them were taught that the important matters in communication are style and mechanics; they do not perceive themselves to be expert in those matters.

These factors may give technical faculty members the impression that they are not qualified to assess students' communication abilities. However, careful attention to

the training of faculty members can contribute greatly to enhancing their confidence that they can indeed assess communication abilities.

The process of developing the rating sheet during the pilot study enhanced faculty members' confidence in their abilities to assess communication effectiveness. Each member of the initial team made significant contributions to generating and revising the rating criteria. As a technical communication expert, I was able to add a few criteria that they might not have considered, but my role was mainly a facilitator to the process. Articulating these criteria indicated that the faculty members did have standards and expectations about the characteristics of effective workplace communication. In subsequent years, during training, I have led a similar discussion with trainees before showing them the rating sheet, and this discussion also has the effect of helping people to articulate previously tacit criteria.

Conducting the assessment involves general discussion of the reasons for the ratings with other assessors. These discussions allowed faculty members to understand the standards of other professionals, especially noting areas of agreement. Such agreement can help faculty members to see that the standards for effective communication are not arbitrary, but in fact socially constructed and shared.

Following the pilot year, I have led training sessions each year for additional faculty members from other departments. These sessions have provided similar results in encouraging faculty members to feel more confident about their abilities to assess student communication abilities.

Gaining usable results while respecting people's time commitments

The purpose of outcomes assessment is to gain valid and reliable results that can be fed back into the planning loop so that one can use them in curriculum decisions. An ideal way to assess communication would consume inordinate amounts of time. Because faculty members already have full schedules, many of them perceived that they did not have time to dedicate to communication assessment. However, if assessment instruments are to be designed locally and administered by those responsible for teaching the students, then accommodations must be made for the full schedules of E&T faculty members.

Resolving the conflicts between gaining usable results while respecting faculty members' time commitments is not easy. However, the process that we developed can provide valid and reliable insights that can guide curricular decisions. After an initial three-hour training session, the assessment process takes only two to four hours of a faculty member's time per semester. Training many faculty members over the years also helps to spread the work load among several individuals.

As the coordinator, I need to devote time to collecting and preparing the samples, analyzing the data, and discussing it with relevant departments. Our dean has

provided clerical support that provides for preparing the samples and tabulating the results. We have been able to average the ratings and present them to members of relevant departments annually. The departments then can use this data to guide curricular decisions at many levels.

Because the ratings are broken down into characteristics, departments can see the areas in which their students may need work. Overall, I find this process to be much less time-consuming than if we were to assess entire portfolios of students' work. In addition, collecting samples from workplace communication courses allows us to focus on students' communication abilities for the workplace, which is where most of our students will go after graduation.

Demonstrating benefits to faculty members of participation in communication assessment

Communication assessment can provide valid and reliable data about students' abilities, but faculty members may have difficulty seeing additional benefits. In order to argue for the worth of participating in communication assessment, I have taken deliberate steps to show participants that their work is important and respected. I have applied for and received assessment development grants so that people who were participating for the first time would receive a \$200 stipend. It is not a great deal of money, but it indicates that communication assessment is valuable and respected.

Money, of course, is not the only benefit. I also highlight professional development benefits for faculty members such as improvement in assigning and evaluating classroom writing and speaking assignments. Several trained individuals have taken their experiences and the rating sheets that we have developed and have adapted them for classroom use. The experiences of past participants confirms that "money spent to compensate teachers for involvement in assessment is also money spent on faculty development and curriculum reform since inevitably both occur when teachers begin to discuss assessment which relates directly to their classrooms and their students."⁸

A benefit of this improved classroom practice may be that students will begin to realize that their communication performances in many courses are being evaluated relatively consistently. This consistency may enhance the goal of having communication abilities taught across the engineering and technology curriculum.

Another benefit of having E&T faculty members on assessment teams is that they were able to discern technical knowledge problems in the students' work that were not obvious to someone who did not have a technical background.

Faculty members at my institution also gained valuable experience in seeing connections between communication and technical knowledge, to come to understand that knowledge is embodied in language and that they do know a great deal about the

communication conventions of their fields.

A final benefit is that the faculty members are able to provide insights into the curriculum deliberations of their respective departments. If faculty members understand the assessment criteria and have helped to conduct the assessments, the results will make more sense to them. They will be able to argue more effectively for curricular changes to improve technical communication instruction for students.

Applying these principles to other schools of engineering and technology

Communication assessment practices need to be customized to fit the unique features of one's particular situation. Although the practices at IUPUI work well for us, I also believe that if someone else were to pick up our process whole and try to transplant it to their institution, it might not fit their particular circumstances. Nevertheless, several principles from this case might be transferred to other settings. These include:

- In aiming for efficient assessment, we need to be careful not to sacrifice validity. In assessing communication we need to assess it as the complex ability that it is. Tests of grammar or scores on standardized tests, while seemingly efficient and reliable, do not necessarily indicate that students can communicate effectively. Rather, having assessors read and listen to student communication artifacts while attempting to simulate the intended audience can yield more valid results about the probable effectiveness of that communication.
- The process and instruments should be designed so that they can provide data that can be fed back into a continuous improvement loop, as we did with the categories on our rating sheets. Although evaluating an artifact holistically may be less time-consuming, the additional evaluation of the various features of the artifact can provide results that emphasize particular strengths and weaknesses in students' abilities. Simply assessing the overall quality of the artifacts would not provide enough data to guide improvement processes.
- We need to be cautious about using approaches that are more appropriate for placement or exit communication assessment. In program assessment, issues such as inter-rater reliability for individual artifacts are less important than in placement or exit assessment. Unlike placement and exit assessment, the primary goal of program assessment is to gain data about outcomes within a program, not to assess individual students' levels of ability. For program assessment, assessing randomly selected samples of student work may be sufficient for useful results.
- Compromises will need to be made. Had we world enough and time, we could design the perfect communication assessment process. In reality, however, we need to explore means by which we can gain useful results without expending resources unduly.

Conclusion

In schools of engineering and technology, standards and practices for assessing students' communication abilities are evolving. The approach discussed here has the potential to provide useful results while taking into account the amount of time and the levels of expertise that faculty members can dedicate to all forms of assessment. We need to make continued efforts to overcome the obstacles to effective technical communication assessment. The impetus provided by accrediting organizations can provide us with opportunities to improve the communication abilities of engineering and technology students and to improve E&T faculty members' abilities to teach students to "communicate effectively."

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Biographical Information

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Appendix A – Rating sheet for writing samples

Criteria for Assessing Students’ Workplace Writing Abilities
 Communication Assessment Team
 Fall 2002

Rater Initials _____ Student’s Major _____ Writer Number _____

	Excellent		Good		Weak		NA
Introduction provides background and a forecast of the document. Problem or situation is defined clearly with orienting material for audience							
Content is selected appropriately. Data are accurate and sufficient							
Assumptions are explicit. Analysis is logical, appropriate to the field, and to overall purpose. Arguments are sound. Data are appropriately interpreted.							
Conclusion is appropriate to the content and situation							
Document is organized so that audience can process information easily.							
Visuals help to make the point and are clear and easy to read for the intended audience							
Wording is concise, clear, and easy to read. Style is consistent and appropriate in formality. Word choice is appropriate to the audience							
Page layout is effective and professional looking.							
Length is appropriate to audience, situation, and content							
Spelling, grammar, and punctuation follow standard conventions							
Credit is given for work from other sources							
Document is appropriate to the situation							
Overall rating	5	4	3	2	1		

Appendix B – Rating sheet for speaking samples

Criteria for Assessing Students’ Workplace Speaking Abilities
 Communication Assessment Team
 Fall 2002

Rater Initials _____ Major of student _____ Speaker Number _____

	Excellent		Good		Weak		NA
Introduction orients the audience adequately.							
Content is selected appropriately for purpose. Data is accurate and sufficient							
Assumptions are explicit. Analysis is logical, appropriate to the field, and to overall purpose. Arguments are sound. Data are appropriately interpreted.							
Conclusion is appropriate to the content and situation							
Speech is organized so that audience can process information easily. Structure of the speech is clear to the audience.							
Visuals help to make the point and are clear and easy to read for the intended audience							
Wording is concise, clear, and easy to follow. Style is consistent and appropriate in formality. Word choice is appropriate to the audience.							
Length is appropriate							
Grammar follows standard conventions							
Delivery is extemporaneous, not read or memorized							
Pace and volume of the voice is at appropriate level							
Body language is relaxed with adequate eye contact							
Visual aid equipment is used smoothly							
Questions and answer time is handled well.							
Speech is appropriate to audience and the speaker’s role							
Overall rating	5	4	3	2	1		