Use of Hypermedia Modules on CD-ROMs to Teach Communication Skills in Engineering Laboratories

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Abstract
The ability to communicate is essential for engineering students, and coursework is frequently offered to provide these skills. However, students often do not transfer these skills to other classes. Techniques used to transfer communication skills from the communication classroom to engineering laboratories at North Dakota State University has culminated in the development of a multimedia Resource Module (RM) which refreshes these skills, promotes transfer, and expands students’ exposure to technical communication. The first section, Written Communication, covers audience, organization, format, and style. The second, Oral Communication, presents tips to avoid common problem areas in giving presentations. The Module is interactive and contains numerous examples.

Introduction
Engineering educators have known for some time that students have difficulty communicating effectively. Industry surveys have shown that students have weak communication skills and are unable to articulate ideas; communication skills should be developed throughout the curriculum and “no survey that makes its way through a faculty meeting or management seminar avoids the issues of communication”.

This ongoing problem has caused faculty at North Dakota State University to devise methods to refresh students’ knowledge of communication skills and effect transfer of those skills to settings other than the communication classroom, i.e., engineering labs. The initial method, that of the communication instructor giving short “writing brush-up” presentations in labs, although effective, was time consuming and cumbersome. The process of refinement initially led to the development of Flexible Education Modules (FEMs) which contained a unit on technical writing. The next phase, the one presented here, was the development of FEMs on CD-ROMs. This allowed yet more material to be presented, and the addition of a section on oral communication.

This paper will describe the five sections in the Communication Module. Four are in Written Communication (Audience Organization, Format, and Style), and one is in Oral Communications. The modules are interactive and contain numerous examples.

Written Communications
The Written Communication module is introduced with an initial screen (a “card”) which lists the contents. By placing the cursor on any category’s “button” and single-clicking the mouse, students can call up information on any area. See figure 1 for the menu. Each of these four areas will be discussed.
Students will not be students forever. While it is beneficial for them to communicate effectively with their instructors, eventually they will enter the professional world where they “must interact with clients and communicate with a variety of audiences”⁶. Clicking on the “Audience” button will bring up a list of various types of audiences the student or the professional engineer may encounter. Figure 2 lists those audiences and, again, the student may click on whichever she chooses.

Laboratory instructors may wish to limit their use of this module to only the Basic and Instructor portions, which speak directly to the standard lab report. Figure 3 illustrates the first card in the “instructor” category. Note that following cards list “Things that instructors appreciate/don’t appreciate.” The “Don’t Appreciate” section includes such items as “hasn’t followed the proper procedure,” “carelessness,” “garbled theory section,” and “copied (plagiarized) theory sections.”

However, the Audience section also affords students the opportunity to expand their practice in dealing with more diverse audiences, such as non-technical people, clients, and managers. These are the folks they are likely to encounter once they leave the university and are perhaps those with whom they have the least experience. If the lab instructor wishes, he may design assignments focusing on, for example, a memo report to management. The Audience section contains implications in dealing with this type of reader, as shown in figure 4.
The Management Examples section gives both strong and weak report samples. This portion is interactive, in that students "are asked to determine whether the example is good or weak. (See figure 5.) Note that on the initial screen, only "Good," "Weak," and "Why?" appear. The student must click on these items to bring up the rest of the text. They are told if their choice is correct or not, and they are given the option of seeing why the example is good or weak. They are also offered a revised version.

Similar information is included for the other types of audience, including descriptions of each audience type, what each type appreciates and doesn’t appreciate, and interactive written examples. Once students have thought about their audience’s level of expertise, expectations, needs, and so on, the next phase is organization.

Organization: The Organization section is divided into four sub-sections: summary (main message), background, discussion, and attachments. We will discuss these four aspects of organization as they pertain to two types of audience, the lab instructor and management.

**Main Message:**
1. "Lab instructor: The usual lab report’s organization is fairly standard, consisting of objective, methods/procedures, results, discussion of results, and attachments. Here, the “main message” is usually nothing more than a statement of the experiment’s objective.

2. Management: These people have more explicit needs, and the “main message” becomes more important. They usually want to know the “bottom line” or “answer” immediately; and they do not want to search for it. A helpful hint on “How to Avoid Hiding Your Main Message” is given in figure 6. This is followed by interactive examples, as shown in figures 7 and 8. Instructions for and examples of formal abstracts are also given, as examples of Summaries (main messages).

**Background:**
1. Lab instructor: This section gives guidelines for and examples of background (methods/procedures/theory) for reports of varying lengths. These range from a simple two-page report to more complex theory-based formal reports. While background is usually required in lab reports to insure that students have correctly set up and run the procedure or have a good understanding of the theory, managers, again, have different needs.
2. Management: They need varying degrees of background information, depending on the situation at hand. Here, students must ask themselves, “How much background will this person need to enable her to understand the report? What will they need “for the record?” Figure 9 shows an interactive example.

Discussion:
This is the heart of the report. It may be called the discussion, the body, the analysis, or the results and discussion of results.

1. Lab instructor: This section covers basic organizational techniques used in a standard lab report, and then describes in some detail the type of paragraphs needed. Figure 10 shows the basic components of a discussion (data analysis) paragraph. This is followed by examples and exercises involving topic sentences (figure 11) and support (figure 12). Finally, numerous examples of analysis paragraphs are given, along with critiques, as shown in figure 13.
These explanations and examples enable students to write their discussion section more clearly and emphasize the significance of their results. In an earlier testing of this section, the results were very positive. When the students consulted the writing stacks, their reports went from 50% rejected to 10% rejected. By term’s end, the reports were of consistently high quality and the assertions were more clearly stated and supported.

2. Management: The organization section for this audience contains varied patterns, which will be adjusted depending on the situation. The sections covered are listed in figure 14, followed, again, by numerous examples. Figure 15 illustrates a type of lab assignment an instructor may choose to incorporate as an option to a traditional lab report.
Attachments:
1. Lab instructor: This section covers standard lab report attachments, such as graphs, tables, and the appendix (including data sheets and sample calculations.)

2. Management: Less technical graphs are discussed here, including some pitfalls and positives of line graphs, bar graphs, and comparison charts. There is also a section on the use of computer-generated graphics and the dangers of “chartjunk.”

This section on graphics, naturally, relates back to the audience and its needs.

Format and Style
These final sections in the Written Communication component cover general information about format, as shown in figure 16, and specific information on and examples of formats for standard lab reports, letter and memo reports, and formal reports. Note that figure 15 illustrates a sample assignment using letter report format.

The style section gives hints that will enable students to write sentences that are clear, direct, and to the point. Mainly, this involves eliminating excess words. The section covers a number of common style problem areas, with sentence examples and revisions. It culminates in a final checklist, as shown in figures 17 and 18.
Oral Communication

The Oral Communication module does not cover such basics as eye contact, proper dress, the necessity of practicing, or such areas as are usually found in a basic speech course. Rather, it focuses on the most common problems encountered by students (when giving a presentation) and also by faculty (when giving a lecture). The DON’TS discussed are: 1) Don’t use a podium; 2) Don’t use “notes”; 3) Don’t use bad visuals (transparencies or slides); 4) Don’t block the screen; and 5) miscellaneous. A brief explanation of each is given, and, since presentations rely greatly on visual effect, video clips of both good and poor examples are given.

Conclusion

The Communication Resource Module will be tested in the Measurements Laboratory course in the spring semester 1996. We will encourage student feedback and, based on that feedback, make any adjustments necessary. We view this Resource Module as an aid to not only encourage student writing in lab courses, but to also facilitate instructor experimentation with audiences and formats outside those of the traditional laboratory report.

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References


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