Teaching Four Different Communication Styles in Freshman Engineering

Elisa Linsky, Naomi Nemtzow, and Gunter W. Georgi
Polytechnic University, Brooklyn, New York

Abstract:

Introduction to Engineering and Design provides freshmen engineering students with an informed understanding of what engineers do. By exposing students to experimental techniques, design skills, teamwork and the tools of the trade, a foundation for further study is established. In this context, it is critical to develop communication skills, both oral and written.

Students are assigned four types of professional written communication: Lab Reports, Software Documentation, PowerPoint Presentations, and a Proposal. Each of these assignments is intended to provide students with a sample of the type of written work that is required of technical professionals.

By introducing four different writing assignments, one combined with an oral presentation, each student is encouraged to be flexible in their mastery of written communication skills. Competence is achieved through repetition. At the conclusion of the course, the freshman are prepared to advance with a fundamental understanding of the methods employed in effective technical communication.

Introduction:

EG 1004, Introduction to Engineering and Design, was created as a survey course for freshmen engineering students to demonstrate what engineers do and what software and hardware tools they use. Various experimental techniques are taught while design and construction skills are developed within the context of a semester-long project. Engineering disciplines that may differ from a student's chosen major are introduced. The departmental goal is to provide a solid foundation for success as students proceed in their educational careers. Critical to the overall success of the course is the development of good technical communication skills, both oral and written.

The students are required to submit written work each week. In addition, they are asked to prepare and deliver an oral presentation detailing their laboratory work. Interspersed periodically throughout the semester are Progress Report Presentations that discuss milestones reached in the semester-long design project. A written proposal is also prepared as part of this project.

The bulk of the weekly writing is in the form of Lab Reports. The first week, however, the freshmen prepare a user profile. The fourth week, they write software documentation.

EG 1004 is unique because undergraduate teaching assistants (TAs) supervise the majority of the laboratory work. The course consists of a weekly three-hour lab, a two-hour recitation, and a one-hour lecture. A team of TAs, an instructor, who moderates the weekly presentations and is responsible for the design project, and a writing consultant, manage each section (there are typically 15-18 sections with 18 students per section every semester).

Two laboratory TAs per section supervise all lab work. They begin the three hour weekly lab with a quiz to ensure students have read the EG 1004 Laboratory Manual. They proceed with prepared instruction (often a PowerPoint presentation). The students then perform the required work in teams following the guidelines in the lab manual and the instruction provided by the TAs. The lab TAs grade all written work for engineering content.

One TA runs the two hour weekly Recitation. The course instructor supervises this session. Each team prepares a PowerPoint presentation describing their laboratory experiment which they deliver in front of the group. The instructor provides pointed criticism, encouraging the presenter's classmates to do the same. Periodically during the term, they also present information about their semester long design projects.

The writing consultants (one per section) attend the second hour of recitation each week. They present a 10-minute mini-lesson about a writing topic, and then circulate among the freshmen, providing individualized help to students who need it. The writing consultants grade all written work, not for engineering content, but for written expression.

The one-hour weekly lecture is given by both instructors and guest lecturers to introduce a variety of engineering topics.

The EG team is comprised of 4 Instructors, approximately 60 undergraduate TAs, and 10 Writing Consultants. The Instructors and some Writing Consultants cover multiple sections. In a typical semester, 300 students are enrolled.

History:

In the spring of 1998, with Gateway Coalition support, an applied writing component was added to the existing EG program to help students develop the writing skills needed in the technical professions. Faculty from Humanities and General Engineering collaborated to develop curricular goals for the writing component of the course. Students were provided with individual and group instruction on the structure and format of lab reports and proposals. Professional writing style and the use of Standard English were also addressed. Writing Consultants from the Humanities Department were assigned to each section of the course, Initially, the Writing Consultants did not grade student writing or present a lesson on a writing topic. Their role was in a support capacity. (3)

The program continued to evolve each semester, with the Writing Consultants becoming more integrated into the team. In the summer of 2000, the EG 1004 Lab Manual was rewritten. Among other changes, instructional materials, developed by the Writing Consultants as handouts, were incorporated into the manual. Lab report guidelines were also included. These provided students with a detailed look at the correct structure of a lab report. Further information on proposal writing was included in an appendix.

Each semester, modifications to the writing program were made. The writing consultants began to grade all student writing for professional style and use of Standard English. This change substantially improved student writing. By providing writing consultants the opportunity to consistently point out and correct errors, students were able to incorporate these lessons into their weekly writing.

The writing program was also provided 10 minutes each week during the Recitation session to deliver a mini-lesson on a writing topic. Subjects like grammar and punctuation, the taking of laboratory notes, the use of persuasive language in proposal writing, objectivity and the use of the passive voice in technical writing, and the correct use of secondary sources are taught. The writing consultants are given latitude to decide what lessons will be most beneficial to their students. In the fall of 2002, PowerPoint presentations were designed to aid the writing consultants in the introduction of new assignments in writing software documentation and proposals.

Modifications and improvements to the writing program continue to be made. The co-ordinator of the program is now included in the weekly team meeting where all matters relating to EG 1004 are reviewed. The engineering faculty has provided an important platform for writing instruction to freshman engineers, encouraging the addition of new types of writing practice and supporting changes developed by the writing team.

Four different communication styles:

The writing assignments in EG 1004 are intended to provide students with a sample of the type of written and oral work that is required of technical professionals. The development of effective communication skills is critical to the success of freshmen embarking on their educational careers. By assigning four different types of communication styles, students are required to be flexible as they master each. The first step is convincing students that these skills are essential to their success.

During the first recitation meeting each semester, the writing consultants deliver a presentation introducing the writing component of EG 1004. A 45-minute PowerPoint presentation stresses the need for all technical professionals to master the ability to communicate their ideas.

Students are asked how much writing they have done before and how important they think

writing is to their future. A few always respond by saying they expect never to need this skill, or to need it only minimally, to compose a few email messages and the like. The writing consultant uses this opening to elaborate on the types of writing required of engineers.

Software documentation, memos, reports, academic writing, and, yes, email are used as examples of the methods professionals use to communicate. The connection between advancement and the ability to write is stressed. The students are told that the most brilliant programmers, for example, will remain obscure if they cannot communicate their thoughts effectively and persuasively.

The remainder of the allotted time is used to describe the writing assignments: Lab Reports, Software Documentation, PowerPoint Presentations and a Proposal. What the writing consultants expect is explained and details are provided on how student work is graded. Finally, the freshmen are given information about Polytechnic's Tutoring Center, especially the Writing Center, where they can seek individualized assistance throughout the semester. Tutors are available by appointment from 10 a.m.-5 p.m. each day, and they are well versed in the EG assignments (many of them serve as writing consultants in the program) They are able to provide the personal instruction some students need to master the skills being taught. The writing center serves as an important adjunct to the writing component of EG. Without the option of individualized instruction, some students would find the assignments beyond their reach.

1.Lab Reports:

The students are required to write seven lab reports over the course of the semester based on the experiments conducted each week. Four are individual reports and three are team reports. The preparation of lab reports helps students understand what they did in lab and teaches the basics of scientific and technical report writing. The reports are composed of a title page, an abstract, an introduction, a procedure section, a data and observation section, and a conclusion. Original data is attached to the copy submitted to the TA. Laboratory notes are attached to the copy submitted to the writing consultant.

The title page includes details important as identifiers. Many students omit required information on this page or include unnecessary information. From the beginning, writing consultants stress the importance of following specifications, as engineers and as technical writers. The lab manual lists what is required on the title page. By deducting points for an incorrect title page, students quickly grasp the value of following directions.

The abstract is among the most challenging sections of the lab report to teach to freshman. They are unfamiliar with the purpose of a scientific abstract and they find concise detail of the sort required a difficult skill to master. Therefore, the composition of an abstract is one of the things the writing consultants in EG 1004 stress early in the semester.

Confusion about the difference between an experimental and an educational objective must first be overcome. The abstract (one paragraph in length) describes what the team set out to do,

not what they were supposed to learn. It must then state the results. By designing a very simple structure for the abstract in lab reports for this course, an attempt has been made to break down abstract writing to its essentials so that students are prepared to write more complicated abstracts in the future.

The introduction is typically two or three paragraphs in length. This section provides background information on the scientific and engineering principles used in the experiment performed. When appropriate, students are encouraged to discuss real life applications of the concepts learned during the experiment. In the manual, each lab contains a section called *Required Reading.* These sections provide the bulk of the information required for the students to prepare the introduction. Occasionally, students are required to do additional research in order to complete the lab report, but for the most part, all the information they need is provided in the manual, by the TAs, and learned during the performance of the lab. Sometimes, a student has prior knowledge of a topic addressed. When this happens, they can write engaging and expansive introductions to their reports.

The procedure section is ¾ page in length. It is always in the past tense and is a description of the steps taken by the lab team during the performance of the experiment. In the fall of 2002, a requirement was added that students take lab notes and hand them in to their writing consultant. Students would frequently prepare the procedures section of the lab report by copying the lab instructions from the manual. In an effort to encourage good scientific practice, a mini-lesson, delivered by the writing consultants, about the correct method for keeping a laboratory notebook was added. A section was concurrently added to the lab manual to reinforce this lesson. Making note taking a required exercise reiterated the importance of this practice. Students now understand that this section of the lab report is a chronological list of the steps followed during the course of the laboratory experiment.

The data and observation section presents the actual data obtained and the observations made during the performance of the experiment. It typically contains one paragraph of text and various graphical elements, like graphs and tables, as required by the data collected. The critical element in teaching students how to prepare this section of the lab report is to differentiate between observations and any discussion of those observations. Students are encouraged to report only what they saw, saving the significance of their observations for the conclusion of their report. Emphasis must also be placed on describing results verbally. Students favor letting the data speak for itself. The writing consultants have to demonstrate the importance of translating data into words.

Finally, there is the conclusion of the lab report. Here data is explained and analyzed. Students are encouraged to speculate on experimental errors and ways of improving laboratory procedures. They are frequently asked to analyze design errors and suggest improvements. Typically ¾ of a page, this section most commonly suffers from the inability of freshmen to draw conclusions from experimental work and project changes in design and procedure. They often don't have much to say and end up repeating information already presented. Both the writing and engineering faculty employ strategies to combat this.

Original data and lab notes are attached to separate copies of the final report and handed in one week after the performance of the lab.

2. Software Documentation:

While learning to write coherent scientific reports is critical to freshman engineering students, other professional writing skills must also be developed. In the summer of 2002, a software documentation assignment was added to the curriculum. Included in the fall syllabus, the project was designed to introduce the fundamentals of software documentation and guide students in the development of a working knowledge of the terms and concepts common in the field.

Since the first step in any documentation project is an analysis of the user, a preliminary assignment was created to be completed during Lab 1. In prior years, students were asked to write a short autobiographical sketch that allowed the writing consultants to make a quick assessment of their writing skills. Now, the freshmen are asked to interview their lab partner. Questions are provided. The students are then instructed to write a one-paragraph user profile. After they have completed that, they are told to write a set of instructions for their user. They choose a simple function from one of the programs they learn during Lab 1. (Microsoft Word, Excel or PowerPoint) Examples are provided. The writing consultants review this work but do not grade it.

Lab 4 is an introduction to LabView, a software package the students must master to complete their semester-long design projects. The performance of this lab provides the perfect opportunity to assign the writing of software documentation.

A user profile is provided. Students compose an introductory paragraph that describes LabView. They must make their users understand how LabView will make their jobs easier, providing an incentive for them to learn it. Then they provide procedures for their users to follow. They may choose from one of three topics.

Task-oriented software documentation is introduced during a 10-minute mini-lesson before the performance of Lab 4. Students are taught how to prepare a scenario that will help their user understand the things the software will help them achieve. A unit titled *Writing Software Documentation* was added to the lab manual to support the students understanding of the subject. The results of the first semester's assignment of this project were very encouraging. Students grasped the instruction and the assignment. Many handed in exceptional examples of software documentation.

3. PowerPoint presentations:

This assignment is the only one that combines both written and oral communication into a weekly presentation that provides the students with practice in the art of effective technical communication in front of a group. During their two-hour recitation, they are required to present

a completed PowerPoint presentation describing the experiment they performed the previous week in lab. They must stand before the class and discuss their laboratory experience coherently, using each PowerPoint slide to effectively illustrate their point. They do this in groups. After they have finished, the recitation instructor and their classmates critique their work.

They are taught to prepare clean, graphically interesting slides to supplement their oral discussion. The use of bulleted lists is encouraged. The bells and whistles so common in some PowerPoint presentations are discouraged. Over the course of the semester, because of the constant repetition of this task, (they present 10 times) they become quite adept at appearing before a group. The most common mistakes are magnified, because often each presenting group makes them. They come to an understanding together of what makes a successful presentation. The experience of the EG instructors in providing and eliciting helpful criticism speeds this process.

At the end of the term, students prepare a PowerPoint presentation describing their semester-long design project. Conference rooms are secured and students are required to come to class in business attire. The atmosphere is as it would be if the groups were trying to sell an idea to a potential client. Students, whose understanding of effective oral and written expression was rudimentary at the beginning of the term, make polished, persuasive presentations to their classmates and the faculty team members.

4. Proposals:

Students are required to prepare a proposal to supplement their semester-long design project. The primary hurdle the writing consultants must overcome is teaching the difference between the objective tone required in a lab report and the persuasive tone needed for an effective proposal.

The purpose of a proposal is to solicit new business or bid for a contract. In their design projects, students choose to build a model house or design one of three kinds of robots. In their proposals, they pitch their house or robot to a fictional client. They begin by composing a one page initial proposal that briefly states the goals and specifications of their design project. This document is reviewed by the writing consultants but not graded.

Before students prepare the first draft of their final proposal at mid-semester, each writing consultant gives a PowerPoint presentation that clarifies the difference between a lab report and a proposal. The requirements of their assignment are described and the format they must use is laid out. The use of the active voice in proposal writing is described and encouraged. The freshmen are instructed to convince their prospective client that there is a problem to be solved, and then propose the solution.

The writing consultants must be careful to make it clear that persuasion is not manipulation, and that while it is fine in the context of a proposal to express an opinion, it must be supported with evidence. They are taught to build a logical argument, establish credibility, and employ persuasive language, while maintaining a professional tone.

In past semesters, the success enjoyed by the program in other areas, where repetition of assignments led to their mastery did not extend to proposal writing. Two things were done in the fall of 2002 to correct this. One was the insertion into the curriculum of a draft proposal due at mid-semester, and the other was a restructuring of the proposal assignment, so that it functioned more like a real proposal, and less like a hybrid lab report.

The proposal assigned in EG 1004 consists first of a cover sheet. A one-paragraph client summary follows. The students summarize what is being designed, the need that the design can fill for the client, and the total cost. The introduction is 3 paragraphs in length and defines the problem and gives detailed benefits the client will realize by purchasing their design. Relevant information about their project is included here. In the case of the Independent House Project, location, climate, population and income statistics are discussed. For the Independent Robot Project, any special features of the design are outlined. The next section is Proposal Scope and Format. It serves as a table of contents for the Features and Benefits section that follows.

The Features and Benefits section is divided into six parts:
1.Practicality of Design - the practical features of the design are specified.
2.General Description- of either the house or robot design.
3.Changes to the original design- what changes were made and why.
4. Development and Delivery
5. Budget-The total cost of the house or robot is stated in words.
6. Data-a short paragraph describing the actual data to be found in the appendix to the Proposal.

One or two strong paragraphs conclude the document. The main design features are summarized. The students must keep the tone both persuasive and professional. An appendix is attached to the document. This includes project specifications, a spreadsheet of the costs, their Microsoft Project calendar, all drawings, a printout of the front and back panels of their LabView program and a one or two page outline of product contract considerations if they were contracted to build 100 units of the designed prototype.

This structure produced significantly more professional proposals. The required information formatted in this way presented students with a clear picture of their goals as proposal writers. The insertion of a draft requirement at the mid-point in the semester proved to be of even greater importance. By forcing the students to consider the written proposal weeks before its final due date, the program encouraged the students to think like technical professionals do when engaged in planning a document. The writing consultants do a careful reading of the draft proposal making specific suggestions for improving the final proposal. By adding this step, students learn the value of draft preparation, document review and editing for grammar, punctuation, clarity and content.

Conclusion:

The assessment of improvement in student writing is very difficult. Most of the evidence we are able to gather is reliable but anecdotal. However, the difference between the reports handed in early in the term and those we see at the end is very clear. Students also tell us how much more confident they feel in their ability to communicate persuasively. A more formal assessment strategy is currently in the works.

By incorporating four different communication styles into EG 1004, Introduction to Engineering and Design, each student is taught to be flexible in their mastery of technical and professional communication. They learn to write a lab report, prepare software documentation, compose and deliver a PowerPoint presentation, and write a Proposal during the course of the semester. They are taught the value of planning in document design and composition through the use of laboratory notes to compose lab reports and draft documents in proposal writing. The value of practice is stressed when presenting orally by having students repeat the process each week until they are experts.

Students who complete this course are familiar with some of the writing tasks they will face as technical professionals. They will be able to draw on their experience at Polytechnic to succeed.

Appendix:

The following documents are reproduced from the EG1004 lab manual (2):
A. The Basic Structure of Lab Reports
B. Writing Software Documentation
C. Design Project – Writing Proposals
D. Guidelines – House

Acknowledgements:

The authors would like to acknowledge the many people who contribute to EG 1004: the instructors, the teaching assistants, our dedicated students who continue to surprise and delight us with their progress, and especially the writing consultants, whose dedication to the importance of teaching writing makes this program a success.

Bibliography:

1. "Introducing Design Throughout the Curriculum," G. W. Georgi, L. M. Folan and D. R. Doucette, presentation
   at the 2002 ASEE Annual Conference, Montreal, Canada, June 19, 2002

2. "EG 1004 – Introduction to Engineering and Design," Laboratory Manual, Polytechnic University, August 2002.

3. "General Engineering Archiving Document," J. Overstreeet, O.N. Russo, N. Nemtzow, Polytechnic

University, 24 May 2001.

Biographical information:

ELISA LINSKY
Elisa Linsky is a co-ordinator of the writing component of the EG 1004 program and serves as a writing consultant in the program. She is also an adjunct instructor of Technical and Professional Communications at Polytechnic University. She received her BA from Wittenberg University.

NAOMI NEMTZOW
Naomi Nemtzow is the Assistant Director of the Department of Academic Success at Polytrechnic University. She is a co-ordinator of the writing component of the EG 1004 program and served for many years as a writing consultant. She has her MFA from American University and her BA from Oberlin College.

GUNTER W. GEORGI
Gunter W. Georgi is an Industry Professor at Polytechnic University. He received his BS from Cooper Union and his MS and professional M. E. Degrees from Columbia University. He is a registered Professional Engineer. He has worked for many years in the aerospace industry in design, analysis and management functions, including Thermal Mission Analysis of the Lunar Module from the Apollo Project.

APPENDIX A : The Basic Structure of Lab Reports

A Laboratory Report has the following parts:

1. Title Page
• Lab title and number, author's name, group members' names, date of lab, course section
2. Abstract
• What was the experimental objective (or purpose) of the lab?
• What were the results of the lab? State briefly.
3. Introduction
• What was the background (or context) of the experiment?
• What were the specifications for the experiment or project?
• What scientific principles or engineering concepts are used?
• What applications are there in society for these principles and concepts?
4. Procedures
• What materials were used?
• What essential steps were performed in the lab, and how were they done?
5. Data / Observations
• What were the measurements or the outcome of the experiment?
• Describe the results verbally.
• Include tables and graphs where appropriate
6. Discussion / Conclusions
• What logical conclusions can be drawn from the collected data and observations?
• What worked and did not work according to the criteria?
• What improvements (if any) can be made to the product or design?
7. Original Data
• Signed by TA

Appendix B: Writing Software Documentation

Computer documentation, when done correctly, enhances the value of the software described by making it easier to use and therefore more accessible. Think of the first time that you used a new program. How did you learn it? Chances are that at some point you referred to a manual or used on-line help. It's also likely that some of the support provided may have frustrated you because of its lack of clarity.

Most documentation projects today use a task-oriented approach. Information is presented in chronological order based upon the job being performed. Here is an example from a quick start guide for a Palm Pilot:

Deleting a note
1. Select the note you want to delete.
2. Tap Delete.
3. Tap OK.
Tip: You can also delete a note by opening it, selecting Delete Note from the Record menu, and then tapping OK.

This how-to approach to all forms of computer documentation, including on-line documents with links to related topics and help files that guide even beginning users, have made more sophisticated software accessible to everyone.

The first requirement for task-oriented software documentation is an understanding of the jobs your users perform. Technical writers gather this information by conducting interviews designed to determine what people do and how they do it with an eye on how the software will make their jobs easier. Let's say you were going to write the manual for Microsoft Word. Your programmers have already shown you all the things the software can do. Now it's up to you to

provide this information to others. Because you've interviewed them, you understand the *tasks* your users perform each day, and you are prepared to show them how all the functions the engineers designed will help make word processing easier. Without the writer, even the best software can remain a mystery to its audience.

There are three types of users. The first is the novice. This user is inexperienced and therefore anxious about learning new applications. It takes a novice longer to learn a program, and they don't like vague instructions. For the beginner, tutorials and guided tours are the documentarian's most effective tools. Novices frequently prefer learning from instructors or other users than from a manual.

The experienced user is open to learning in new ways. They see the computer as a tool and are not anxious about mastering new applications. An experienced user is significantly more receptive to manual usage and on-line help and will be willing to be flexible in taking instruction.

The expert user, unlike the other two, understands and cares about how a program *works*. These users will occasionally refer to the manual and will use on-line help a lot. They will master a program quickly and will grasp many functions with little or no instruction at all.

Now that you understand your user, it is time to design tools to help them. Software documentation can take many forms. There are User Guides, manuals, tutorials, Help, quick reference cards and Getting Started sections, often used for installation and set-up, as well as reference guides designed for referral only. For our purposes, we will concentrate on the manual.

For the project you will undertake in Lab 4, we will begin with an Introduction. In this section you should explain what the software does, briefly, so that the user has some idea of what to expect. Think of it as a *definition* of the program. For example:

Palm m100 series handhelds will help you get to meetings and appointments on time, remember people's names and personal details, and track items on your To Do list. You can enter your schedule in Date Book; keep all your contact names, addresses, phone numbers, and other details in Address Book; prioritize and assign your asks a due date in To Do list; and jot quick notes directly on the screen in note pad.

To keep your data extra safe, you can synchronize your data with the Palm Desktop organizer

software on your Windows or Macintosh computer so you always have a backup copy.

Remember, you can't write a whole manual in one paragraph. Your Introduction is like a highlight reel that will get the reader acclimated. Keep in mind as you write that readers of manuals often skip the paragraphs and go on to the instructions. To avoid this, keep it short. Paragraphs work best when they support simple concepts, such as a definition of terms, but they must read quickly and easily. In your introductory paragraph, you should provide the following information: First, what LabView is. Second, what a Virtual Instrument (VI) is.

Following your Introduction will be the Procedures section. You will begin with a scenario, and then provide step-by-step instructions. We will use a standard format. It consists of steps, notes, screens and other elements aligned on the left margin and continuing in a single column in a numbered sequence from first step to last.

A scenario reminds the user what the task about to be described will help him accomplish. It has the dual function of introducing the task and suggesting workplace applications .The scenario should set the user up to perform the steps. Here are a few examples of scenarios:

You can use the Display command on the Options menu to change the colors in the MS-

DOS Editor window, display or hide scroll bars, and set tabs.

You can remove programs that you don't want to appear in the Scan to Application window, or change the default format for each program's files.

The edit menu is available with any screen where you enter or edit text. In general, commands available in the Edit menu apply to text that you select in an application.

The procedure section describes step-by-step what you want the user to do. They are typically numbered lists of instructions that follow chronologically with as little digression as possible. For example:

To display full header information:
1.Open an e-mail item.
2.Tap the Complete Header icon.
Tip: To redisplay the abbreviated header, tap the abbreviated header icon.

Removing and installing ink cartridges
1.   Remove the new ink cartridge from its package.

2. *Remove only the yellow part of the tape seal on top. Don't pull off the blue portion or try to remove the clear seal underneath the cartridge.*
3. *Make sure the EPSON Stylus Scan is turned on and not printing. Open the document cover, and then open the maintenance cover. The internal cover opens automatically.*
4. *Press the cleaning button and hold it for about three seconds until the print head moves left and the operate light begins flashing.*
5. *Pull up the ink cartridge clamp. The cartridge rises up from its holder.*
6. *Lift the cartridge out of the EPSON Stylus Scan and dispose of it carefully.*
7. *Lower the new ink cartridge into its holder with the label facing up and toward the back of the printer. Don't press down on the cartridge.*
8. *Press down the ink cartridge clamp until it locks in place.*
9. *If you need to replace the other ink cartridge, repeat the preceding steps before going on to Step 10.*
10. *Close the maintenance and document covers, and then press the cleaning button.*

Here are a few guidelines to keep in mind as you begin your writing. Focus on actions rather than functions. Talk about what the user will *do*, not how the program will *work*. Unlike the style we employ in Lab Reports, in Software Documentation use the active voice. (Correct: *"You can use the file menu to…"* Incorrect *" The file menu can be used to…"*

Remember, simplicity helps in every aspect of software manual writing. This can't be over emphasized. If your writing is clear and direct, your manual will be easier to use.

The tone you adopt should not be overly formal. The manual you write should sound conversational. Pretend you are talking your user through the software. However don't go overboard and forget the importance of correct grammar and syntax. And don't forget to use articles.

Software documentation is increasing handled by technical professionals. Mastering these skills will make you more employable. Even if you are never called upon to actually perform the task, you will work with others who do. Your understanding of their objectives will make you a better colleague.

APPENDIX C : DESIGN PROJECT - WRITING PROPOSALS

You will write about your design project in a document called a proposal. *Proposals are commonly used in business and professional settings. What makes document a* proposal, *rather than just a final report, is that it incorporates persuasion, and it uses a standard proposal format.*

How is a proposal similar to a lab report?

Like a lab report, a proposal is a piece of writing that conveys information about a project. Both reports and proposals convey information accurately, clearly and correctly to the reader.

How is a proposal different from a lab report?

These two kinds of writing differ in **purpose** and in **tone**.

The purpose of a **lab report** is to tell what was done in the lab: to describe the experiment or the design problem and state the results as objectively as possible. When writing lab reports, the goal is to use an **objective tone**, which is very neutral, omitting emotions.

The purpose of a **proposal**, on the other hand, is to solicit new business or to bid for a contract. Therefore, a proposal needs to persuade the reader that the idea or design being put forward is a good one, and worth the cost. A proposal uses a **persuasive tone**.

How can a designer write in a persuasive tone?

Convince your prospective client that there is a problem to be solved (for example, a need for a certain type of house or robot). Next, you will propose your solution to the problem (i.e. your design). Then, you will convince your client that your solution is the best solution. To be persuasive, you will probably express an opinion, but remember that the opinion must be supported with evidence. Persuasion is not manipulation. Think of the client's needs, your own

professional credibility, and the logic of your argument.

Example**:** The house designed by K & K Construction is extremely comfortable to live in because it has the following features….

Note: It is okay to use first-person and second-person pronouns when writing design proposals for EG1004 (*I, we, you*).

e.g. *We* designed the robot to navigate the maze ….

What proposals will be written in EG1004?

The proposals written in EG1004 will pertain to the semester-long design project, either the house design or one of three robot design projects.

Initial Proposal: This short proposal will be written at the end of Lab 2. It will briefly state the goals and specifications of the design project. Describe in complete sentences the benefits of the location you've chosen, the potential buyers of your home. Then, give a brief description of the layout of your house including the special features and benefits of your design.

Draft of Final Proposal This working draft of your final proposal will be written after Lab 5. It will be reviewed by your writing consultant and will serve as a template for your final proposal. Include a client summary, and an introduction, features and benefits, and a conclusion. (Refer to the appropriate EG1004 guidelines for Final Proposals in Appendix B.)

Final proposal: You now need to sell your design to the client. This longer, more detailed proposal will serve as a final written document for the design project. The final proposal will be handed in at the end of the semester after you've completed your Final Project Presentation.

Note: See outlines for Final House Proposal and Final Robot Proposal, which follow.

APPENDIX D : Guidelines for Single Custom Built Final House Proposal

The Final House Proposal will use a format typical for *proposals.* This document will incorporate persuasion. Proposals are often used in professional and business settings. Please refer to the previous pages, **Design Project - Writing Proposals** for more information about *proposals,* and how they differ from lab reports.

Outline for House Proposal: Follow this outline, using the same headings that appear in **BOLD CAPITAL LETTERS** below.

COVER SHEET:

    Title of proposal

    Name of company

    Names of company members

EG1004 section

    Date submitted

CLIENT SUMMARY (1 short paragraph):

    In 3-4 sentences **summarize** what is being designed, the need that the design can fill for potential clients, and the total cost. This summary is similar to the abstracts you've been writing in your Lab Reports but it uses *persuasive* language.

INTRODUCTION (2-3 paragraphs)

    Establish a need for the project in the business setting. ("What's the problem?")

    Give a detailed description of the benefits of the design to buyers. ("What's the

solution?")

Be sure you provide relevant information regarding the location of your house, the climate, population and income statistics relevant to your local and any other benefits specific to the location you've chosen.

SCOPE AND FORMAT

This section of the proposal is like a table of contents for the ***FEATURES AND BENEFITS*** *section that will follow.* ***For this section only, copy the list exactly as it appears below.***

1. **Practicality (or luxury) of design**
2. **General description of the house**
3. **Changes to original design**
4. **Development and delivery**
5. **Budget**
6. **Data**

FEATURES AND BENEFITS

Following 1 or 2 introductory sentences, address the topics listed above in PROPOSAL SCOPE AND FORMAT.

1. Practicality **(or luxury) of design: Describe the practical features of your house. If your house also has special features, describe them. (1-2 paragraphs)**
2. **General description** of the house:
   a. Describe the layout of the house, including each room. Refer to your basic floor plan drawing. (1 paragraph)
   b. Discuss the roof design, type of roof and reasons for choice. Refer to your elevation drawing. (1 paragraph)
3. **Changes to original design**: What changes did you make? Why did you make them? (1-2 paragraphs)
4. **Development and delivery**: How will you develop and deliver your house?

Refer to your MS Project. (1 short paragraph)

5. **Budget**: State in words the total cost of the house. Did it come in at or under budget? What was the cost for each category of materials and labor? Refer to your spreadsheet of costs. (1 short paragraph)

6. **Data**: Your actual data will be appended (added) to the end of the proposal. Briefly tell your readers what they will find in the appendix. (1 short paragraph)

CONCLUSION (1-2 strong paragraphs)

Summarize the main features of the house, emphasizing the positive features. Remember to keep your tone both professional and persuasive.

APPENDIX

Be sure to include the following data in your appendix:

· **State the specifications** of the project, as given in class.

· **Spreadsheet of costs** for each category of materials and labor and **total cost**

· **MS-Project**

· **Drawings:**

Original sketch

Four separate floor plans:

(a) basic layout with labels (without dimensional, electrical or plumbing layout),

(b) dimensions with labels,

(c) electrical layout with labels and symbols, and

(d) plumbing layout with labels and symbols.

Two fully dimensioned elevation views, including roof design (the front and the side that has the most design features)

Isometric (3-D) is optional

- · **LabView** printout of front and back panels
- • **Product Contract Considerations:** You have currently designed and built a prototype. If you receive a contract to build 100 units, what considerations are necessary to successfully complete this contract? This section should be no more then two pages. It should incorporate persuasive language. Consider items such as financing, storage, staffing, etc.

Print out 2 copies, 1 for your TA and 1 for your writing consultant. Include all data, except the original sketch on both copies. The original sketch should go to your TA.