Implementing a Web-Based Tool To Improve Writing Education in Engineering

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Abstract

A new approach to writing education is being implemented in programs in the School of Engineering at the University of Dayton. This new approach required extensive, current resources for both students and faculty. The need for these common resources has been addressed through the use of the web-based material, developed in-house and available to faculty and students.

This paper presents the role of the web in writing education and the development of such a resource. The web site discussed in this paper provides tools, help, structure, and evaluation of writing formats for some programs in the School of Engineering at the University of Dayton. The resources include department-specific formats and preferences, and also more general resources with links to further resources for writers. Web-based formats for writing technical documents may become a standard for instructors who are concerned about producing better documents.

As the web site is just one tool used in a new approach to writing education, the overall approach to writing is presented in the paper as well. This approach resulted from employer input that engineering graduates often lack expertise in various forms of writing including correspondence, executive summaries, and design proposals. Requiring a separate technical writing course and then technical reports in a few others simply does not achieve the expectations of employers. The faculty determined that a more integrated four-year experience may yield better results, but it could not be implemented without common and current resources to use as a guide. The solution to this need has been met with the web-based tools as described in this paper.

Background

In the early days of personal computer software development, tutorials quickly made inroads into the educational market. This trend continued as computers became connected through the Internet. Today with the proliferation of the Internet into many aspects of society, it is not surprising to find web-based learning sites on almost any topic. One early trial of the Internet as a knowledge provider was “distance learning” which began as an aid to students who were more isolated and couldn’t get to a physical school. Today it’s hard to find a school, either urban or rural, which isn’t connected to the Internet. Besides being able to research most topics on-line, students are also using the Internet as an extension of their education. Students increasingly submit papers, projects, and assignments electronically without ever printing on paper, and instructors assign papers, post grades and even communicate with students as they work – all on-

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line. Many college professors are incorporating electronic learning by putting their course materials, assignments, and even instruction on personal web pages. Since many students have easy access to e-mail, some faculty members are incorporating virtual discussions and virtual teams in the curriculum. This technique allows students and instructors to engage in threaded discussions about a particular topic at a designated hour. Students might even "team" on projects with other students they've never met who are located in separate locations. With so many electronic options open to university faculty, teaching methods and course design are changing to take advantage of the new possibilities.

The University of Dayton has embraced innovations in technology and is committed to providing the best infrastructure to assure that graduates are prepared to use technological tools as they enter their chosen fields. For instance, all in-coming freshmen are required to buy a university computer loaded with course software that will be used in their undergraduate studies. The student residences are wired to the campus mainframe and high-speed Internet connections. Besides access from dorms and housing, the students also have access to computer labs on campus where they can get to email, log-on the Internet, and use course software. Faculty are provided with computers and high-speed connections in their offices, and a variety of training sessions from noon-hour seminars to semester-long classes. These courses are also repeated during summer sessions so that the faculty has opportunities to keep up with software advances and innovative teaching techniques.

The School of Engineering is no exception. The building has two large computer labs for classroom instruction and student use. Some departments also offer a freshmen-level course that covers basic software and an introduction to programming so that students are prepared to use computers for their engineering courses.

A needs assessment for teaching writing

In 1998 the University of Dayton Department of Engineering Technology was re-evaluating and re-structuring the entire curriculum. Several environmental changes drove this need including a reorganization of faculty and a change in leadership. The department chose to focus its offerings on engineering technology courses. For instance, the math and chemistry courses that were taught by faculty within Engineering Technology were discontinued and were replaced with courses offered in the general university curriculum.

Another course that was offered within the department was technical writing. It had been a two-credit-hour course in the curriculum for decades. This course was highly valued and it served the students well. Writing can be a weakness in graduates from many programs, and this course addressed many of the skills required of engineering technology students. While the curriculum required technical reports in other courses, this course specifically addressed writing as its focus. Qualified, part-time faculty had taught the course for at least the last 15 years. These instructors were handpicked by the department because they understood the focus of the course and the needs of the students. It was clear, however, that the department was no longer going to be able to offer this course. The faculty needed to consider dropping the requirement or adopting a course offered by the English department as a substitute.

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The department considered what other engineering schools had done to address this need for good writing in the classroom. Some linked with personnel in the English department to help with both writing instruction and grading of papers. Others hired an English specialist to work with the faculty on writing assignments and to help grade the papers. While these approaches offered many advantages, it did remove the classroom instructor from a dialog with the students. It also sent the message that writing is not an engineering concern. With ABET and the department's industrial advisory committees asking for better integration of writing with the engineering concepts, the department chose to go with a new plan for improving writing and putting writing as an explicit goal for all department courses.

The matrix approach

The department's discussions on technical writing instruction led to thoughts about developing a new approach to writing in engineering. Maybe some student learning did not need to be contained in a 15-week, classroom format. The university had a few years of experience with "Writing Across the Curriculum," a thoughtful plan to implement writing as a focus throughout the total general education experience. Championed by a professor in the English department, it is an approach that embraces the concept of "connected learning" where a skill is developed and reinforced over a longer period of time with respect to other elements of a student's education. Thus students writing would be integrated into each course and be evaluated both for the content and writing style common to the particular discipline.

"Writing in the Discipline" is an extension of this approach. Recognizing that each discipline has specific needs that differ from others, "Writing in the Discipline" supports a deliberate, systematic plan to address the needs of a particular discipline. Clearly Engineering Technology graduates will assume careers with different writing demands, styles, and formats than graduates in criminal justice or education. The "Writing in the Discipline" appealed to the department, and was adopted as the new writing focus.

To implement this new approach, the department chose to develop a matrix, shown in *Figure 1*, where the writing assignments were listed on the y-axis and the courses on the x-axis. Each course became "the home" for at least one of the writing formats as a way of presenting some of the class material. Each professor was responsible for teaching the format and evaluating the writing of final assignments.

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Plan for Technical Writing in the Discipline													
	First Year Seminar	Technical Drawing & CAD	Computer Graphics Lab	Statics & Dynamics	Strength of Materials	Fluid Mechanics	Design-Machine Elements	Mechanical Measurements	Thermodynamics	Senior Project	Materials & Processes Lab	Senior Seminar	Form Totals
Memo- Design proposal		1	1		1	1	1			1			6
Memo- request for information										1			1
Thank you letter										1		1	1
Letter of transmittal							4			1			5
Lab result summary								3			1		4
Project Specifications			1	1			1			1			3
Laboratory report								3			2		5
Design Report			1		1	1	1			1			5
Emails- short	4	2	2										8
Technical description	2		6					1					9
Cover letter for resume												1	1
Resume	1											1	2
Annotated problem solving				4	4	4	8		4				16
Class totals	7	2	10	5	6	6	15	7	4	6	3	3	

Figure 1 **– Sample Technical Writing Matrix for Discipline**

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Benefits of using the web as a tool

Understandably some faculty members felt inadequate to teach writing formats, but without an initial structure, students would be lost when it came to structuring their papers. Since technical writing is not a focus of the required freshman composition courses on campus, it was obvious that it had to be taught in some way. However, the School of Engineering was facing changes in the curriculum and decided to address the writing problem by implementing a web page that could provide the support needed for both faculty and students.

The web site was developed in-house by the technical writing instructor from the Department of Engineering Technology (http://www.engr.udayton.edu/special/writing). A web page for technical writing support made sense for several reasons. First, our students were comfortable using computers and the Internet for preparation of their assignments both university-wide and within the department. Faculty was also familiar with the many techniques of computer-based education and with Internet support. Secondly, the web page was readily available to all students. Finally, the web page was easy to change and update. Web pages could be altered as professors added materials or requirements to papers. It was also flexible to meet course or department changes in the matrix or display several versions of the same format as different instructors developed their objectives for an assignment. The integrated approach to writing in the discipline seemed to be the best solution to the writing dilemma, and for this to work, the web-based tool was critical.

The web page is accessed from a link on the home page of the School of Engineering. It includes examples and annotations for each of the possible writing formats – resume, process description, instructions, proposal, research reports, lab report, etc. Also the vehicles for these writings are included - letters, memos, and e-mails. To assure that the student has a clear picture for each type of writing, the explanation page has three sections:

- Overview of the basic elements of the writing (*Figure 2*)
- An annotated example with engineering content (*Figure 3*)
- A troubleshooting checklist that includes text design, content, and grammar considerations (*Figure 4*).

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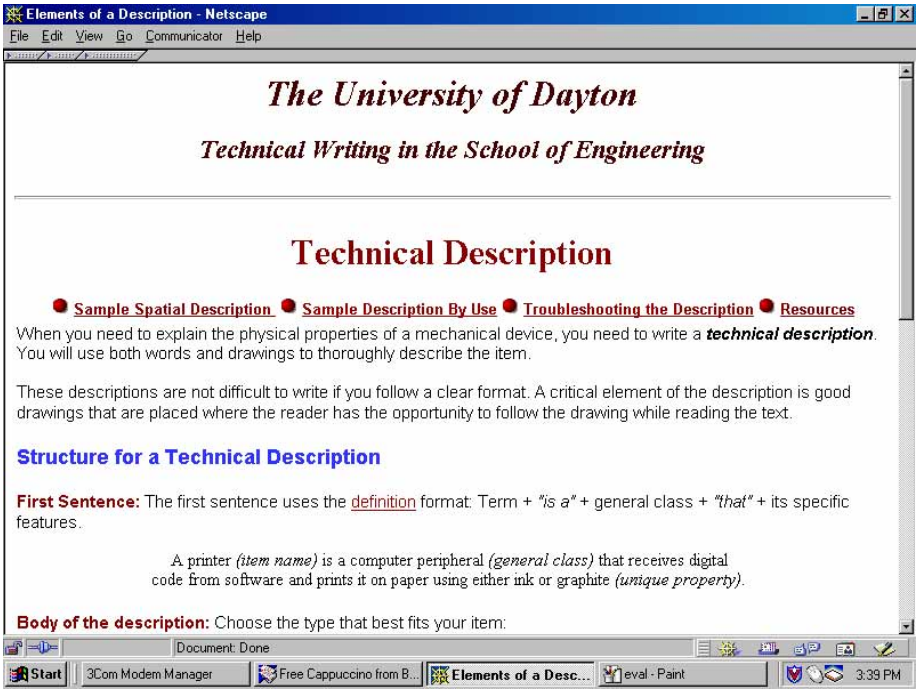
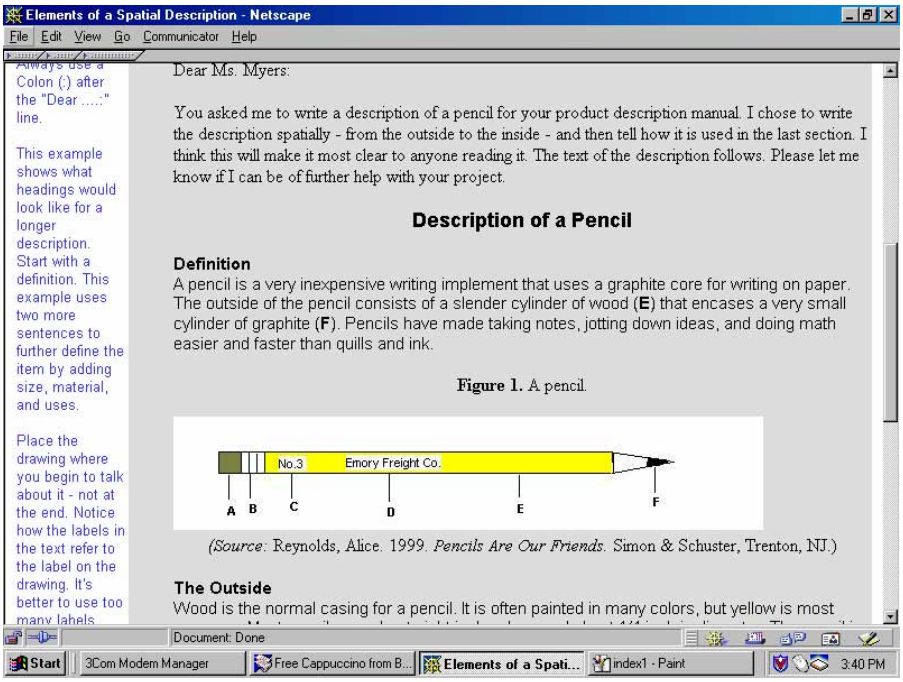


F*igure 2.* Sample of an Overview from Technical Writing Website



F*igure 3.* Sample of an Example of a Writing Format from Technical Writing Website

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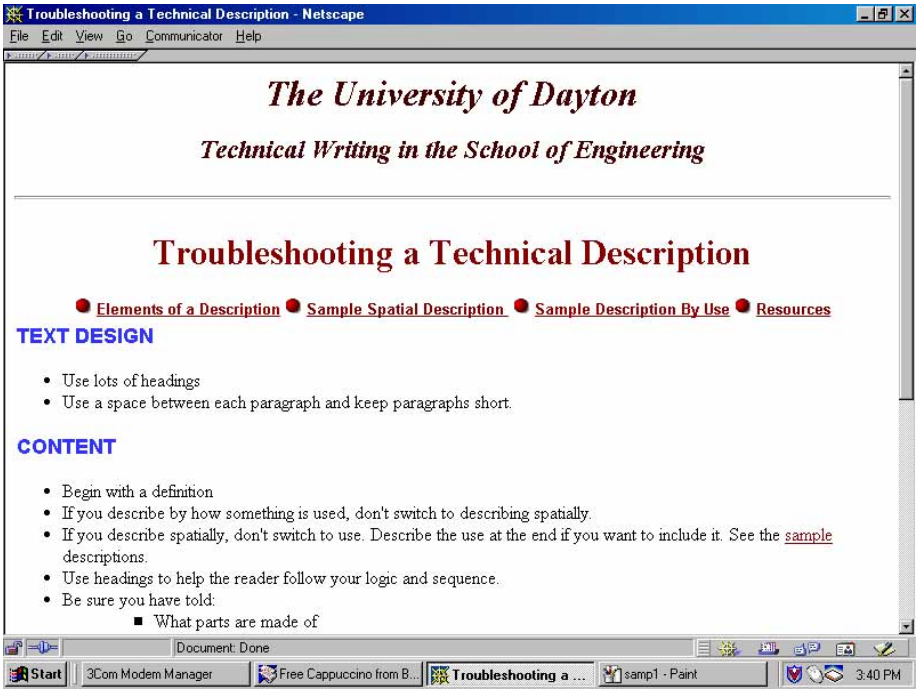
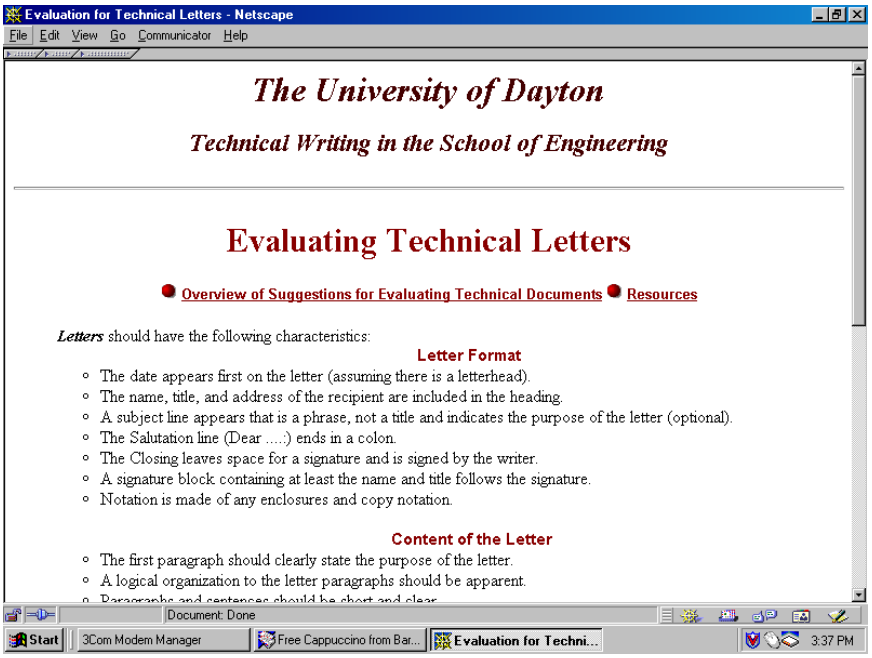


F*igure 4.* Sample of a Troubleshooting Page from Technical Writing Website

These sections are helpful to both students and faculty. A faculty member might use the explanation page to get an overview that would help in preparing to teach the format. The example page provides clarification about the format and "look" of the writing. The trouble-shooting page determines what is important to for students to focus on when writing. Additional help for faculty on the web site includes evaluation criteria for each of the formats. (*Fig. 5*)



F*igure 5.* Sample of an Evaluation Page from Technical Writing Website

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The section on evaluating student writing addresses such issues as grammar, readability, text design, content, and structure. Using the web page will help faculty members feel more comfortable teaching and evaluating the writing assignment indicted by the matrix for their courses.

Department informational sessions are also available for faculty who want to learn more about the various formats and how they might be evaluated. These sessions are in-house and designed with specific goals that meet the perceived needs of the faculty. Sometimes a little encouragement to get through the first assignment is all that is needed to assure faculty members that writing is indeed within their ability to teach and evaluate.

Students will find the example section for each format especially helpful as a "blue print" for writing an assigned format. The overview page will be most useful to the "big picture" students, and the troubleshooting page will help all writers determine the strengths and weaknesses of their writing. In addition the web page provides links to many other Internet sources for grammar help and to technical writing web pages at other universities. From the outset, one guideline was not to recreate what is already available on-line but to provide guidance for the writing formats covered in the engineering technology curriculum.

Advantages of using the web pages as a writing tool

For the University of Dayton's Department of Engineering Technology, web-based writing support made good sense. First, the students are already equipped with computers, support software, and a foundation for using their computers as a tool when preparing assignments and researching. As students become familiar with the writing web page, they will begin to feel at ease with the tool and understand how to use it effectively as they create their written assignments. Secondly, since the site is easy to maintain, update, and add to, it remains dynamic as the needs of the department change. Finally, two of the first year courses include using the Internet and other software tools to complete assignments so students are accustomed to using web pages to help with assignments in their major classes. Studies show that students learn just as well from well-designed sites as they do from any other source. A dedicated classroom instructor combined with a thoughtfully developed web page will enhance students' ability to communicate effectively with professors about what they learned in each course.

As students progress through their undergraduate years and write using a variety of formats, the writing process will become their natural means of communicating their discoveries and understandings. They will gain confidence in using technology to enhance writing skills, and then they will take these skills with them as they begin their careers. Integrating writing formats into the curriculum will make them better-equipped writers throughout their lives.

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Limitations of a web-based tool

It would be foolish to tout a web site as the perfect solution to producing better collegiate writers. The Web is a key component to a new writing strategy. It is a vital tool to lessen the problems for many students and faculty associated with teaching writing. Writing is never easy even for professionals, so a web site cannot overcome all the difficulties. The department understands that some of the faculty will still express the need for an English professor to address the writing needs of the students. Others may advocate a specific course that will address the writing process. Even though many instructors write very well and some write professionally, they may still feel inadequate when grading writing assignments for grammar and structure. However, an important message to students about writing is sent when professors are teaching and evaluating student writing rather than handing it off to a "writing person." Other faculty concerns stem from a full syllabus that has no extra time to introduce writing or to respond to yet another assignment. These issues will be debated in the department, but when there is no other means to address the need for writing, the faculty will have to work to both incorporate writing into the curriculum and evaluate it so that the student will continue to improve.

Conclusion

As with any new method of building a structure, the tools must be tailored to fit the job. If the tool is not working efficiently, it must be re-tooled until it adapts to the task at hand. Using a web tool to help teach writing is a new approach and the site will necessarily go through changes both to content and structure as it is used and evaluated. Some students and faculty will use it more than others, but as it becomes incorporated into the content of each course, student writing will improve. Also students will begin to internalize the concept that writing is part of what an engineer does. Just as strong math skills improves a person's chances for getting better jobs and quicker advancements, good writing skills will also increase a student's competitiveness in securing a good job and becoming a successful engineer.

Using Internet technology and well-designed web sites is gaining popularity in many sectors as a means for teaching concepts and sharing information. Electronic communication is the acceptable way to do business both locally and internationally. The quick response time, personal nature of e-mail and discussion groups, and the ability to save messages and transmit large amounts of data make technology a permanent part of the business world. Colleges and universities will be expanding their own links with technology as more studies are conducted assessing the effectiveness of web-based courses and Internet research. Providing a web-based writing tool to help students become better writers will become part of the lexicon of universities of the future. The University of Dayton's Department of Engineering Technology wants to be in the forefront of this new type of writing support and the experiences using the tool will benefit other educational institutions as we all strive not to separate writing from engineering but integrate writing into engineering education. This effective integration of the discipline and writing should produce graduates that are more experienced, more comfortable, and more effective writers.

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