e-Technologies in Engineering Education Learning Outcomes Providing Future Possibilities

Using E-Mail Logbooks to Facilitate Scientific Publication

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Abstract

Writing a scientific article for publication provides new and often difficult challenges for the engineering student. Of the various approaches to teaching scientific writing, the genre approach and the process-oriented approach are both important, especially when there is a focus on the student's own development of academic identity. Development of academic identity seems to go hand in hand with development of academic writing. A preliminary study in which doctoral students of engineering (approximately 150) write e-mail logbooks as part of a scientific writing course shows that e-mail logbook writing seems to be a strong facilitating factor in students' development of their academic identity as well as their prowess in academic writing.

I. Introduction

Engineers and engineering students face many challenges throughout their studies. For many engineers, the greatest challenge seems to come when they try to put the results of their engineering efforts into the form of a scientific article. Some of them recall starting out in engineering – and how relieved they were when they started working with numbers instead of words. They think back on how they made their career choices: pondering upon formulas and working with concrete problems was the future for the engineer, working with words could be relegated to English majors. Suddenly, however, they find themselves in an intimidating position: before them is a computer with a blank screen, waiting for the words to fall into place.

Unfortunately for most of us – engineers or not – those words simply do not fall into place. But, also unfortunately, there is no sense in carrying out scientific work if that work does not get published. This is where I come in. I teach a course called "Scientific Publication" to graduate students in engineering. The aim of the course is to provide the students with the opportunity to write various types of scientific texts, with emphasis on the genre of the primary scientific article.

While I use e-technologies in various ways with my classes, the technology that appears to have had the most positive effect on

students' academic writing is e-mail. When students use e-mail to write logbooks they tend to write better academic texts. It appears that through their e-mail activity, students construct and redefine their own professional identities; this, in turn, has a positive effect on their professional writing. Some theoretical background from academic writing research, as well as excerpts from some of the students' own logbooks, should provide some explanation for how such development takes place.

II. Approaches to Teaching Writing

A. The Genre Approach to Writing

When engineers take a writing course, their main interest is in learning how to write a proper scientific article in English. In other words, in order to become a part of their own engineering "discourse community," they must learn to write (and talk) like other engineers. In the "genre approach" to writing, we recognize that if students are to learn to write like engineers, they must learn the vocabulary, the text structure and the style that engineers use in the various professional texts they write.

Writing researchers such as John Swales, Greg Myers, Charles Bazerman, Carol Berkenkotter and Thomas Huckin and others have analyzed thousands of scientific articles and have provided us with everything from basic patterns for the global structure of articles (e.g., IMRAD: Introduction, Material and Method, Results And Discussion) to local structure (e.g., Swales' model for introductions, CARS: Create A Research Space [18]). Corpus studies have provided us with information about such details as the placement of new information in a sentence and the typical use of verb tense in specific sections of an article. All of this research has culminated in a variety of valuable "How to..." books for writing scientific articles.

However, just as having a good recipe for apple pie does not guarantee a good apple pie, knowing the genre requirements for a scientific article does not necessarily produce a good article. In order to become part of the engineering discourse community, an engineer must be able to put his knowledge about writing into practice. Genre experts such as Aviva Freedman [9]

challenge the idea that we can teach students the genres they need for their professions; she maintains that the student must participate in the discourse community in order to acquire the necessary genre knowledge. Transferring this idea to the writing class, this means that it is important to organize the learning situation in such a way that it enhances the student's development in writing like an engineer as well as enhancing his development as an engineer.

B. The Process-Oriented Approach to Writing

While the genre approach to writing has its main focus on the text as a product, the process-oriented approach to writing has its focus on the writer and the writer's own process of writing a text. Research on the activity of writing (e.g., by Flower and Hayes [8]) has taught us that writing is a cognitive process, not simply a production process. The process-oriented approach to writing encourages the writer to work with writing in a series of stages. These stages vary according to both the task and the writer, but in general we can say that the first stage is devoted to deciding what to write about (using such techniques as brainstorming, freewriting, mind-mapping, etc.) The next stage is the drafting stage, during which the writer should get feedback on his text. After up to several rounds of drafting and response, the writer completes his text with an editing stage, paying attention to spelling, punctuation, references, etc.

By paying more attention to the process of writing instead of the product, researchers have found that writing is not only a process for producing texts, it is also a process that promotes learning. We now distinguish between two types of writing: writing for others e.g., publishing an article, and writing for ourselves. When we write for ourselves, we have the chance to develop our ideas, to try out ways of thinking and expressing our ideas. These ideas may or may not result in a scientific article, but they will definitely have been given the conscious attention that leads to putting those ideas into perspective, and giving them priorities. Writing about a topic makes us conscious of what we know well enough to put into words, while it also makes us keenly aware of what we do not know.

Recognizing the importance of writing to reflect and to learn, the process-oriented approach to writing incorporates "logbooks" (sometimes called diaries or journals) as part of the approach. By writing their thoughts about a topic or a problem in a logbook, students have the chance to reflect consciously on whatever they write about. As Andrew Wilkinson put it:

> *"Writing can help us more to consider our thoughts, to analyse our feelings, because it gives us time to do so. In a way it serves the function of a mirror enabling us to reflect on ourselves and thus to make changes…"*
> Wilkinson [19, p. 1]

This is the background for using logbooks in a scientific writing class. In their guidelines for writing logbooks, The Commission on Composition, of the National Council of Teachers of English listed the following relevant conditions and research references for writing logbooks:

- *"When people articulate connections between new information and what they already know, they learn and understand that new information better (Bruner, 1966).*
- *When people think and figure things out, they do so in symbol systems commonly called languages, most often verbal, but also mathematical, musical, visual, and so on (Vygotsky, 1962).*
- *When people learn things, they use all of the language modes to do so – reading, writing, speaking, and listening; each mode helps people learn in a unique way (Emig, 1977).*
- *When people write about new information and ideas – in addition to reading, talking, and listening – they learn and understand them better (Britton, 1975).*
- *When people care about what they write and see connections to their own lives, they both learn and write better (Moffett, 1968)."*
> Fulwiler [10]

C. Writing and Identity

Newer research in writing combines the focus on genre knowledge and with the more individual approach of the process approach. One of the key figures in such an approach is Roz Ivaniè who states:

> *"Writing is an act of identity in which people align themselves with socio-culturally shaped possibilities for self-hood, playing their part in reproducing or challenging dominant practices and discourses, and the values, beliefs and interests which they embody."*
> Ivaniè [12, p. 32]

According to Ivaniè, we can view "every act of academic writing as...the writer's struggle to create a discoursal self which resolves the tension between their autobiographical self and the possibilities for self-hood available in the academic community." [12, p. 336] This view of writing gives strong support to the use of e-mail logbooks: writing e-mail logbooks provides the student with a unique opportunity to examine his own "autobiographical" self (personal and cultural background) while developing his "discoursal" self (possibilities for self-hood as an engineer). The logbooks I have collected from my students clearly demonstrate the students' awareness of their multifarious identities and their efforts to position themselves in their academic, discourse communities.

III. E-mail Logbooks in Practice

A. E-mail Logbooks as Part of a Writing Course

My special interest in the role of e-mail logbooks is based on several years of experience incorporating e-mail logbooks as part of a twelve-week scientific writing course for doctoral students of engineering. So far I have taught approximately 150 doctoral students and have received over 700 e-mail log entries from my students. The course is partially based on various forms of e-technology (e.g., bulletin board, retrieval of hand-out material, discussion groups, reference base for frequently-asked questions, language exercises, links to other sources). However, the e-technology that appears to have the greatest effect on students' academic development is e-mail.

The requirements for the course include submitting eight e-mail logbook entries during the course of the semester – normally one logbook a week for eight weeks. Each logbook should be: a plain e-mail (not an attachment); approximately one screen in length; in English; and about the student's project (or other topic of choice).

In addition, the students are given a few recommendations (do's and don'ts) about writing e-mail logbooks: do spend at least 10 minutes on each e-mail logbook entry; do write once a week; do write freely (instead of planning and organizing first); don't worry about grammar, spelling, etc.; don't worry about vocabulary; and don't spend time on formatting.

Students are reminded that the logbooks are, if nothing else, a chance to practice writing in English without worrying about getting red marks on their papers. In fact, I make it clear that I will NOT be making any corrections to their English. My intention is to make it clear that the purpose of this writing task is to have a chance to write freely about a topic – preferably their own project – in English.

Students are informed that they can expect response to their e-mails, normally within twenty-four hours. However, they are also informed that my schedule might cause me to reply (at least temporarily) with no more than a brief message acknowledging that I have received their e-mails. All responses are intended to be "authentic" responses [16], i.e., they are questions or comments directly related to the topics that the students themselves have written about.

Students may submit their e-mail logbooks whenever it suits them best. Typically, it suits them best to write during the afternoon after our morning class or during the evening or night before class. Typically, too, that means that I am usually at my computer when the e-mails come in and I can respond to them almost immediately.

In the rest of this paper, I will let the students' own writing demonstrate some of the advances they make in reflecting, learning and writing in their academic, discourse community. The students' own (unedited) comments will also illustrate how e-mail logbooks are a medium that encourages students to "[re-solve] the tension between their autobiographical self and the possibilities for self-hood available in the academic community" [12, p. 336].

B. E-mail and the Autobiographical Self

One student, Dick, openly writes about his struggle with his "autobiographical" self and his professional, academic self:

> *"If I want to or need to, I have an ability to completely avoid thinking about a given subject. This can be very helpful in the sense that it helps me focus on matters of interest and ignore other subjects with a lower priority. Unfortunately this ability can easily be misused. If something is very frustrating or annoying, I tend to block it completely out of my mind, rather than let the problem be worked at consciously or subconsciously.*
>
> *Too often I have done this in regards to my Ph.D.-studies. This week it was intentional, but most of the time it has been an automatic response to my lacking progress. The problem is only that this response adds to the lack in progress. In fact in most cases it pro-longs the problem itself…Being aware of this tendency in me, at least I have something to work on."*
>
> (Dick)

Nearly all of the students write something about their personal (autobiographical) life in their logbooks. Sometimes this takes up the whole logbook entry; most often it is a final paragraph – perhaps as an attempt to be more personal after having been professional for two or three paragraphs. Non-Norwegian students tend to write something about their homeland, especially if it is around the time of a holiday. Norwegian students typically write about their families if they have children: women consider the problem of having enough time for both children and doctoral projects, while their male counterparts express their pride in being new fathers.

Some of the engineering students choose to write very little about their projects. From these students I have learned much about films, martial arts and Italian cooking, just to mention a few of the topics. Perhaps the students have a need to demonstrate that they are not "nerds" whose only interest is in their doctoral project? Or perhaps they simply want to share more of themselves than they are able to if they limit their topics to their doctoral projects. Several students have talked to me about how important it is to be considered more than just an engineer/researcher.

Some students even take on roles of entirely different people when they write their e-mails. One student wrote all of his e-mails as if he were Star Trek's Captain Kirk ("Beam me up!"), trekking in outer space. In the example that follows, (where he refers to himself in third person) he tries to excuse his verbosity:

> *"We have also noticed some unknown activity on the cpt. Kirk's paper. It is expanding, but the source is not known yet. Most likely the cpt. Kirk's inability to express himself in fewer words (Isn't this e-mail the proof by itself?) We hope that this quantum jump from 10 to 12 pages will not be disastrous to our ship's hull. We assume that the Starfleet command will advise us if it must be clinically cut!"*
> (Kirk)

This same student (who comes from an eastern European country) seemed to have an affinity for western TV and movies. When he was not Captain Kirk, he borrowed his expressions from various other characters, for example Ace Ventura ("Alrighty!") and or a Looney Tune character "That's all folks!". All of "Kirk's" logbooks are a combination of play and professionalism.

C. E-mail and "Self-hood in the Academic Community"

One of the most important considerations for my students is that they need to communicate in English in order to take part in their discourse community. Nearly all of the students who take the course are non-native speakers/writers of English. While students are not necessarily keen on writing logbooks to start with, most of them are easily convinced that it might be good for practicing English. As one student put it:

> *"At first I thought the idea of writing a logbook was just another waste of time, but after considering the amount of writing I have been performing in English lately, which in fact have been kept at an minimum, I think this is a chance to improve my writing. Trying to handle the language and making some thoughts about the writing process is a good session getting ready to make good scientific papers and finally a Ph.d. thesis."*
> (Tom)

In another logbook entry, Tom demonstrates that logbook writing is an opportunity to work through some problems he has in positioning himself in his discourse community.

> *"An article was represented on a conference lately presenting an analytical temperature distribution model for the friction stir process. After having studied the article with my tutor I realise that I have discovered some very unclear parts. Actually I think they have used the analytical solutions wrong. On the other hand they have made it very clear that the models is a first attempt to make a simplified temperature distribution model for the new welding process. My problem is whether I should mention these points and refer to the article in my paper, or just be happy by the fact that I think my model will be a better approach.*
>
> *After some considering I think the best idea is not to refer to the article. First of all I am making a numerical model with the finite difference approach, making ruff statements about an analytical model would be misplaced. I think the reader would get the feeling that I just wanted to state that they had done something wrong, instead of being interested in the discussion "for what boundary conditions are the analytical solutions valid."*
>
> *I was reading the above sections thinking about what to write next when I got this very good idea for an introduction. Because the analytical temperature distribution solutions are only valid for specific boundary conditions, or implementation of other boundary conditions would make mathematical expressions not easily solved, I can state that a numerical model would be a better approach. Readers could then read the article mentioned above and might keep in mind my points on the boundary conditions. By this approach I would not offend anybody, and I don't fail the risk that it was me that was wrong in the first place...."*
> (Tom)

Tom's problem solving takes place on different levels, all of which lead to his defining his position in his discourse community. First he solves the problem of why the other scientists have written an unclear article – they have failed to use the proper tools of analysis. However, this realization causes him new problems since he now must decide whether or not he should bother referring to their article when he writes his own article. While he considers taking the easy way out and ignoring the article instead of criticizing it, he also considers his discourse community's need for answers to their questions about boundary conditions. Suddenly he sees an answer: "I was reading the above sections…when I got this very good idea." He finds a way to point out the other authors' problems without openly criticizing their work. At the same time he can focus on what he wants to present without focusing too much on others' problems.

Tom's logbooks are excellent examples of how students can use logbooks to work through their professional problems. He is clearly aware of his own choices and position, as is evidenced in the way he writes "I realize," "I think," "whether I should," "I can," "I would," etc. At the same time, his logbooks continue his project of experimenting with ways to express himself professionally and in English.

IV. Preliminary Results

One of the most obvious results that may be related to the e-mail logbooks is that students who enroll in the course also complete it. This is also true for those students who take the course without credit.

As their teacher, I am able to observe the changes in students academic writing: At the beginning of the course, the average students tend to write haltingly; alternatively, they use other experts' words instead of trying to compose original statements. Later, the students develop a more authoritative approach to their own projects as well as to their language and style.

In their course evaluations, the students state the value of e-mail logbooks from their point of view: "they made me think about what I actually was working with," "I got a lot of needed practice writing English," and "I don't worry so much about writing a paper".

V. The E-mail Edge

A. Pedagogy and E-mail

With regard to the writer's learning and reflection, the importance of logbook writing has been established. So why do I encourage the use of e-mail logbooks instead of paper logbooks? From a pedagogical perspective, it makes sense that e-mail logbooks should be superior simply because e-mail makes it possible for students to get (almost) immediate feedback on what they have written. In addition, the writing and the response are both authentic and individualized. Each student chooses his own topic and the teacher responds directly to what the student writes about. Since students are already accustomed to writing e-mails without thinking about editing, e-mail logbook writing is conducive to the student's acceptance of the idea that logbooks are intended as a medium for thinking and writing, and not for correction and evaluation.

B. The Autobiographical Self and E-mail

The major difference between using the various types of e-technology in teaching writing is that most of the technology provides only a source of information. And most of what the technology provides is relatively uniform and objective. E-mail logbooks, on the other hand, provide an approach that focuses on individual and subjective academic development.

E-mail logbooks seem to encourage some students to write more privately and in depth than they would with paper texts. This may be related to the fact that the writer is invisible to the reader during the writing situation. At the same time, the writer and reader are very close in time - and can even have a form of conversation as the reader/teacher responds while the writer

is still on-line. This often leads to response to the response, etc., that may continue through several exchanges of e-mails between student and teacher.

In addition to the relative anonymity and temporal proximity, e-mail *seems* to be temporary. It seems less permanent than paper logbooks: e-mails may be deleted at the touch of a key and they do not take up space in a ring binder. Students may thus be less intimidated by writing in their e-mail logbooks than they are by writing on a more permanent medium.

C. The Engineering Discourse and E-mail

From both a practical and a discoursal perspective it makes sense that e-mail is a preferred medium of communication. It is easily accessible for both the writer and the reader. More importantly, perhaps, is the fact that the engineering student is familiar with using the computer to communicate, so his/her threshold for writing e-mail logbooks is probably significantly lower than it would be for writing paper and pencil logbooks. Writing e-mail logbooks reinforces the engineering students' experience of being an engineer, whereas writing on paper for a writing course might more of a challenge, or at least incongruent with the writer's picture of himself as an engineer.

V. Preliminary Conclusions

While engineering students are often intimidated by the idea of writing scientific papers, a writing course that incorporates e-mail logbook writing seems to facilitate the students' progress in writing academically. The positive effect e-mail writing has on academic writing seems to go hand in hand with the students' development of their academic identity.

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