Beyond Numbers: Supporting Writing in Engineering

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Beyond Numbers: Supporting Writing in Engineering

**Summary**
Writing is a critical component in the field of engineering. Practicing engineers and engineering employers are keenly aware of the need to prepare undergraduate engineers for professional writing activities; however, the undergraduate engineering curriculum focuses almost exclusively on technical skills. Although writing activities are, in some cases, becoming increasingly integrated into the curriculum, writing is often viewed by undergraduates as a non-essential skill. This workshop could be delivered by either an engineering or a writing instructor and is designed to support an integrated engineering writing task such as a lab report, senior design project or journal article. By focusing on several pivotal writing skills that are appropriate for both undergraduate and graduate level engineering students, participants will receive practical strategies for building and crafting paragraphs and tools for self-editing tools to help increase the clarity of their writing. Although one writing seminar cannot address all of the issues and challenges of writing in engineering, it can provide an initial opportunity to create awareness of the importance of writing and provide practical resources to encourage continued growth.

**Keywords**
Engineering, writing instruction, active learning

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Beyond Numbers: Supporting Writing in Engineering
Sarah Jane Payne, Dalhousie University

SUMMARY
Writing is a critical component in the field of engineering. Practicing engineers and engineering employers are keenly aware of the need to prepare undergraduate engineers for professional writing activities; however, the undergraduate engineering curriculum focuses almost exclusively on technical skills. Although writing activities are, in some cases, becoming increasingly integrated into the curriculum, writing is often viewed by undergraduates as a non-essential skill. This workshop could be delivered by either an engineering or a writing instructor and is designed to support an integrated engineering writing task such as a lab report, senior design project or journal article. By focusing on several pivotal writing skills that are appropriate for both undergraduate and graduate level engineering students, participants will receive practical strategies for building and crafting paragraphs and tools for self-editing tools to help increase the clarity of their writing. Although one writing seminar cannot address all of the issues and challenges of writing in engineering, it can provide an initial opportunity to create awareness of the importance of writing and provide practical resources to encourage continued growth.

KEYWORDS: Engineering, writing instruction, active learning

LEARNING OBJECTIVES
By the end of this workshop, participants will be able to:
- appreciate the value of writing as part of the practice of engineering;
- build and craft a paragraph using technical language;
- identify active and passive sentence structures and transform an active sentence into a non-wordy passive sentence;
- develop skills for self-editing and creating clarity in their own writing; and
- find writing resources for independent writing improvement.

REFERENCE SUMMARIES

Clear communication is essential to any organization. Bechky identifies several communication barriers between three groups of employees at a manufacturing facility: engineers, technicians and assembly line workers. By providing specific examples of communication failures during problem solving discussions, this article will provide context and insight into how communication barriers occur outside of one's own discipline or profession. The article also provides insight into how the use of jargon and other profession-specific concepts can create confusion when communicating with other groups in the same work-site. This article can help inform the group discussion on the need for and the challenges of creating clear inter-professional communication in the workplace.

Silyn-Roberts (1998) describes how engineers read reports (by scanning for most the relevant information first) and how they write (by expecting the reader to read from start to finish). The author identifies the disconnect between how engineers tend to acquire written information and how they share written information with others. The article also discusses the time that engineers spend engaged in professional writing activities and provides practical approaches and examples that can be used to guide engineers in writing workshops. Silyn-Roberts discusses the complexity and appropriate use of active and passive sentence structures and provides examples that can be modified to suit any engineering discipline.


Silyn-Roberts (2002) discusses the results of a study that analyzed the reading strategies of engineers. This article provides more insight into the specific approach that engineers use to obtain information from technical documents and offers insight into the culture of writing in engineering. In the seminar, the concepts covered in this article may be used to help spark or inform group discussions on reading and writing conventions in engineering.


The Purdue University Online Writing Lab (OWL) provides a simplified algorithm for changing active sentences into concise passive constructions. Active sentences typically contain fewer words and tend to be easier to read. However, many engineering and professional journals do not permit the use of personal pronouns, making the use of active sentences challenging. Passive sentences often contain redundant words and are unnecessarily long. However, the simple algorithm provided by this article can make passive sentences more concise. This algorithm can be used as one of the group activities.

### CONTENT AND ORGANIZATION

<table>
<thead>
<tr>
<th>Duration (min)</th>
<th>Subject</th>
<th>Activity</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10</td>
<td>Introduction and Survey</td>
<td>Introduce yourself. Ask the class if they enjoy writing and why or why not. Afterwards, ask the class what types of documents they believe that engineers write and how much time they believe engineers spend writing them. Be prepared to lead a discussion on the audience’s preconceptions about writing in the practice of engineering discipline and inform the audience about...</td>
<td>Determine the audience’s preconceptions about writing in the practice of engineering discipline and inform the audience about...</td>
</tr>
<tr>
<td>5-10</td>
<td>Engineers as a Cultural Group</td>
<td>Using Bechky (2003), briefly discuss the communication challenges experienced by engineers when communicating with those outside of their discipline. Use one of the examples given in the Bechky article. If the class has some engineering work experience, this may be an appropriate time to invite comments about their experiences communicating with non-engineers in the workplace.</td>
<td>Create interest in the need for clear communication and provide some background for an informed discussion.</td>
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| 10  | Cookbook Paragraph | Present the following formula for a basic paragraph: 1. Topic sentence 2. Evidence 3. Discussion

Give examples of types of information that would fit in each section.

See Appendix A for a sample handout to distribute. | Present the cookbook paragraph writing strategy. |
| 10  | Demonstration: How to Write a Paragraph | Provide the class with content to insert into their paragraph in the form of bullet points. Use the previously discussed paragraph components (topic sentence, evidence, discussion) to organize the content. Build a paragraph by using linking words such as coordinating conjunctions, eliminating jargon or slang, eliminating contractions and eliminating vague words or pronoun | Demonstrate the process of writing a paragraph. By demonstrating how to write more clearly, this demonstration will prepare the participants for the paragraph writing activity that follows. |
references such as “it” or “they”. Clarify that not all paragraphs require such rigorous construction, but that this approach will help give the writer a starting point.

As you demonstrate the process of writing a paragraph, verbalize your thought process. Explain why you want to eliminate certain words and why you think certain words sound better. Read each sentence of your paragraph aloud including any revisions. Explain why you believe the sentence sounds clearer after you add linking words.

You can also solicit participation from the participants. Ask them if they have any suggestions for a different linking word. You can comment on alternatives that may be more, less or equally effective.

See “Write Here, in Plain Sight” promotional video from the Faculty of Graduate Studies, Dalhousie University (2011) for further information regarding this section.

| 20 | Activity: Writing Paragraphs | Divide the class into small groups of approximately 3-4 participants per group. Hand out photos of ambiguous technology such as a widget, which has no obvious function. Groups will have to name the technology, imagine its function and describe its benefits. Each group must write a sales pitch in the form of a paragraph. One person from the group will read the paragraph aloud to the class. | Give the participants an opportunity to use the cookbook paragraph writing method. This also allows the participants the opportunity to present and discuss their writing process. |
| 5 | Strategies for Overcoming Writer’s Block | Generate a group discussion on which types of writing activities the class finds the easiest and the most challenging. Ask them to share some strategies for overcoming writer’s | Allow the participants to share their experiences of the writing process. This will encourage |
### Strategies for Self-Editing

Introduce self-editing strategies such as reading aloud and peer editing.

Reading aloud is useful because writers can catch small typing errors, grammatical errors and incomplete sentences if they read their own writing aloud. This allows the writer to recognize that what they meant to write does not always correspond with what they put on paper.

Peer editing is valuable because it provides new perspective. Peers can ensure that ideas follow a logical progression and that the reader receives the writer’s intended message.

### Active and Passive Sentence Constructions

Using the Silyn-Roberts (1998) reference, discuss appropriate uses of the active and passive voice in sentence construction.

Encourage the participants to share their experience of how they have previously used or observed these sentence structures.

### Activity: Transforming Wordy Sentences

Using the reverse paramedic method described on the Purdue University OWL website (2011), find other examples of wordy passive sentences that are appropriate to the engineering discipline.

Divide the class into small groups of 2-3 people and have the groups work together to transform a wordy sentence into a less wordy version. When they are finished, ask the participants to apply the algorithm.

The variety of solutions will provide an opportunity for further class discussion.
groups to share their revisions with the rest of the class.

| 5 | Finding Additional Resources | Although one writing seminar will not provide instant improvement in writing quality, it may spark interest in the need to improve writing. Discuss other strategies for improving writing through peer editing, tutoring and the use of grammar guides. Leave the class with a list of available resources at the university such as library links, web-based grammar guides, writing centre hours, tutoring services, and so forth. Make sure that participants are aware of the writing resources available to them so they can independently improve their writing over time while at university and, later, in the workplace. | 

**Total Time:** 70-80 minutes

PRESENTATION STRATEGIES
This presentation highlights the need for engineers to communicate clearly by exploring some of the barriers to effective communication in the workplace. Engineering students are often unaware of how integral writing activities are to the practice of engineering. As a result, this topic may garner some interesting comments, particularly from undergraduate students. Be prepared to discuss the importance of writing in the engineering field with the participants.

This workshop includes the following two activities:

**Activity 1: Writing Paragraphs**
Constructing a paragraph can be challenging both to a novice writer who may be confused about content and/or format and to an experienced writer who may be writing in a new genre. Although the participants may be confident in their general writing abilities, it is not always obvious to novice technical writers how to transfer their existing writing skills to technical writing. The formulaic (cookbook) approach to paragraph writing is an easy way to build a paragraph from related but not easily connected information, such as by linking the writer’s experimental results with established scientific literature. This approach to writing a paragraph allows the writer to build a logical paragraph. Further, it is easier to craft and polish writing assignments once they are on paper. Following the demonstration, create small groups for the group activity. If they wish, participants have to opportunity to be creative and humorous although they can employ technical language that is similar to the language they would use in their own field. Since this activity does not require them to discuss their own work or research, it is a non-intimidating activity.

**Activity 2: Transforming Wordy Sentences**
Self-editing is also a challenge for most writers. This presentation offers the participants some ideas and strategies for improving the clarity of their writing through the elimination of wordy sentences and using appropriate passive and active constructions. Following the short lecture on passive and active sentence constructions, give a demonstration of the reverse paramedic method to reword a wordy sentence. Show the reverse paramedic process, step-by-step. For the activity, divide the class into small groups and provide the participants with the reverse paramedic formula either as a hand-out or by writing it on the board. Let the groups reword sentences and encourage participants to read their answers aloud. Since there will be several possible solutions for each example sentence you can incorporate a discussion into the activity. The participants can then discuss which sentences they found easiest to understand.

By incorporating these two activities, the facilitator has several opportunities to generate classroom discussion. Participants will have the opportunity to share their ideas while working in small groups and also as part of larger class discussions. The handout will give them a tool that they can use on their own, such as when they may be struggling to get started on a writing project. Since the handout is the same paragraph writing strategy demonstrated during the workshop, it will be familiar to them.

ADDITIONAL REFERENCES


APPENDIX A: Handout for “A Cookbook Paragraph”

A cookbook paragraph

Step 1. Getting started!
Write down everything you have in bullet points. Don’t worry about grammar or style yet! Just get your ideas onto the paper.

Step 2. Put sentences together.
Rewrite bullet points as sentences. Use punctuation. You may also need to combine some of your bullet points into a single sentence.

Topic sentence (introduce idea/ concept)
•
•
•
•

Evidence (facts from other literature, experimental findings)
•
•
•
•
•
•

Discuss (compare/contrast, limitations, benefits/implications)
•
•
•
•
•
•

Payne, 2012; Dalhousie Writing Centre, Dalhousie University, Halifax, Canada

A cookbook paragraph

Step 3. Polish your work.
Eliminate any jargon, avoid intensifiers (really, very), avoid unnecessary ambiguous words (it, they, them, those), and avoid contractions (can’t, don’t). Use linking words (consequently, however, by contrast etc.) to create an easy to read paragraph.

Step 4. Re-write your finished paragraph.
Proofread your finished paragraph to ensure clarity.

Payne, 2012; Dalhousie Writing Centre, Dalhousie University, Halifax, Canada
APPENDIX B: Sample of Activity 1: A Cookbook Paragraph

Below, I have provided an example of a cookbook paragraph that I have used in sessions for environmental engineers. I recommend that you write a paragraph that is specific to the engineering discipline of the participants who will be attending the workshop.

Step 1. Getting Started: Write down your ideas

Step 2. Put Sentences Together: Combine your bullet points to form sentences using proper punctuation
Step 3. Polishing Your Work: Eliminate jargon, avoid intensifiers, avoid ambiguous words and avoid contractions. Use linking words to create an easy to read paragraph.

**Polishing**

E. coli is a coliform bacteria that can be found in both the intestines of warm-blooded animals (ref) and the environment (ref). Some strains of E. coli, such as O157:H7, can cause illness in humans (ref). Currently, the detection tools used by public health authorities do not distinguish between pathogenic and non-pathogenic strains of E. coli. However, specific detection tools would allow a public health authority make a more informed response to a positive E. coli result.

Step 4. Rewrite Finished Paragraph: Now you can begin the process of proof-reading and self-editing.

**Your finished paragraph**

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APPENDIX C: Materials Checklist

Prior to beginning your workshop, ensure that you have the following materials:

- Images for the small group “Writing Your Own Paragraph” activity
- One “Cookbook Paragraph” handout for each student (see Appendix A for sample)
- A list of active sentences that can be transformed into non-wordy passive sentences specific to the participants’ discipline
- A list of writing resources that the students can access, such as the university's Writing Centre, helpful websites, titles of grammar guides available at local libraries