PITCH: PROJECT TO INTEGRATE TECHNICAL COMMUNICATION HABITS

A Workshop in PITCH Design & Practice
Tagliatela College of Engineering
University of New Haven
Topics

- PITCH OVERVIEW
- THE TECHNICAL MEMO IN EASC 1107: INTRODUCTION TO ENGINEERING
- DISPLAYS OF DATA
- COPE PRINCIPLES IN ACTION
- LABORATORY REPORTS IN 3\textsuperscript{RD} YEAR COURSES
- PITCH IN SENIOR DESIGN
Question: “Within my organization, to what degree are technical communications skills considered in hiring and promotion decisions?” $N = 121$.

**PITCH: AN OVERVIEW**

The Need: Employer & Alumni Survey
Question: “In a typical work week, I spend about the following number of hours performing technical communication tasks (writing, reading, speaking or listening).” N = 121.

PITCH: AN OVERVIEW

The Need: Employer & Alumni Survey
1. Technical Communication Products
   a) Plan, design and produce letters, technical memoranda, short reports, formal e-mails, reports documenting experimental or simulation methods and results, and formal reports (proposals, analyses, progress reports, senior design documents).
   b) Plan, prepare and deliver oral presentations and poster displays.

Learning Outcomes

PITCH: AN OVERVIEW
2. Technical Communication Habits
   a) Use appropriate format and content;
   b) Exhibit clear, precise and logical expression;
   c) Demonstrate appropriate organization, level of detail, style and tone for a given audience, situation and purpose;
   d) Demonstrate appropriate syntax and correct usage of grammar and spelling;
   e) Highlight or identify critical information;
   f) Present, discuss, and summarize data accurately and persuasively;
   g) Write thoughtful and persuasive conclusions and recommendations;
   h) Work effectively to produce multi-author communications.
By the time you work through the sequence of PITCH courses in Chemical Engineering, you will have completed 32 assignments. These assignments are designed not only to increase your engineering knowledge, but to provide you with the communication skills that alumni and employers tell us you will need to succeed as a working engineer.
1. Engineering faculty delivered technical communications instruction
2. Lead faculty hand-picked for each targeted course
3. Incentives provided to participating faculty
4. 3-day summer training workshops held
5. Consultant provided support throughout year
6. 16 engineering and computer science faculty trained and participated in first two years
7. Project led by the dean

PITCH: AN OVERVIEW

Faculty Participation and Training
Resources developed are available at the PITCH website
www.newhaven.edu/engineering/PITCH/

- Learning Outcomes
- Roadmaps
- Faculty, alumni and employer survey results
- Advice tables and guidelines
Student work on PITCH assignments in all classes are being archived for future longitudinal assessment.

Improvement in technical communication will be assessed by evaluating student skill development from freshman to senior year.
JEAN NOCITO-GOBEL
Professor of Civil & Environmental Engineering
Tagliatela College of Engineering
University of New Haven
THE TECHNICAL MEMO IN
EASC1107: INTRO TO ENGINEERING

- First semester, freshmen course
- Hands-on, project-based
- Engineering concepts introduced through 4 projects
- Communication using technical memos
CHOICE OF TECHNICAL MEMO

- Commonly used in industry
- Type of writing that requires:
  - Focus on conciseness
  - Need for summation
- Frequency of writing
FRESHMEN BACKGROUND VS. PITCH SKILLS

Expressive → Direct style of writing
Lab Reports → Explaining data
General → Specific audience
Introduction → Summary paragraph
UNIVERSITY OF NEW HAVEN
Tagliatela College of Engineering

September 4, 2013

To: Laboratory Staff

From: Mike Raffaie, Laboratory Manager

Subject: Homestead Industrial Project: White Pine Testing

Homestead Industrial, Inc. has asked us to verify the strength of weathered white pine boards previously used for siding on homes. They would like to reuse the material and are concerned about the strength. Since wood is such a highly variable material, thirty samples will have to be tested to finance in compression. The resulting maximum strengths should then be analyzed statistically and compared to an existing standard. This comparison is important in addressing Homesteeds concern.

Please perform the testing and analysis detailed in the assignment below and write a company memo to me. I am familiar with the standard lab practices but will not be aware of your specific results. I will proof your memo into a more formal letter to Homestead. Please keep the memo short and to the point.

Your Assignment — a memo report to the project manager

Perform the compressive testing as detailed in our standard laboratory practices (on the web site) and provide the following results:

- Provide the minimum and maximum (range), mean, standard deviation and coefficient of variation of the failure strengths. I would like these values presented in a table.
- Include a histogram plot of the failure strengths.

Your memo should answer the following questions:

1. The National Design Specification (NDS) for Wood (1997) lists the allowable design stress for No. 2 white pine as 675 psi. Using the test data, what is the probability that the strength of a sample will be larger than the published value p (sample data = 675 psi)? Assume a normal distribution as detailed in our lab manual.

2. On a percentage basis, how much larger (or smaller) is the mean failure strength than the published value of 675 psi? For example, you could state, “The mean strength from the test data is (mean - 675 psi) percent higher than the published value for No. 2 white pine as listed in the National Design Specification for Wood (1997).”

American Society for Engineering Education Annual Conference--Indianapolis Indiana: June 15, 2014
### Advice Table for Technical Memos

<table>
<thead>
<tr>
<th>Advice</th>
<th>Explanation</th>
<th>Example</th>
</tr>
</thead>
</table>
| **Respond to your reader’s needs. Most work assignments should respond to a reader’s specific request for information.** | Consider the factors that govern your reader’s interest in your memo and address those factors in the way you organize your memo:  
- Has the reader asked for specific information, often in a list of questions?  
- Is the reader aware of the subject and its importance?  
- Why does the reader need this information?  
- What level of detail or evidence will the reader require to accept the content of the memo? | Rephrase the primary question as a statement to open your memo. That way you make sure you place the most important information first.  
- Here are the data you requested regarding the thermal diffusion experiments. The results should be useful to the Composite Materials Group and should answer their questions regarding our procedures. The attached graphs illustrate our specific results. |
| **Like the Subject line to your advantage.** | Focus the reader’s attention by using a subject line that highlights the critical ideas in your memo. Make the subject precise. A generic subject line can mask the importance of the information. | Prefer a subject line such as:  
- **Subject:** Serious Violations of Safety Regulations — Building A3  
- Avoid generic or overly broad subject lines such as:  
- **Subject:** Safety Inspections |
| **Get to the point.** | Except for “bad news” situations, begin your memo with the major point you wish to make. Don’t make the reader search for the answers to the important question (s).  
- Prefer a direct, specific opening: We believe the equations used in our procedure are valid for use in the design you propose (followed by a list of reasons why and any limitations or qualifiers to your statement.) | |
| **Give structure to the information.** | Make sure that headings, paragraphs, and lists reflect distinct groups of information arranged in an order that makes sense to your reader. The reader needs to follow the strict line of reasoning and evidence that leads to your primary points. Avoid mixing ideas or going off on points that are not centrally related to your conclusions. | Prefer a structure that illustrates the structure of ideas:  
- The equations we used would not suit your design for two reasons: |
ASSIGNMENT REVISION

- Written in memo format
- Audience specified

Customer Awareness Project

An important part of any design project is communication of that design to the client. For the Customer Awareness Project, students will work in teams to design material and report findings. Your company is exploring new markets and is trying to break into the market of toys for offices and desks. You have been asked to develop a product to compete with the Rubik’s cube.

Design Requirements

- Each puzzle design must have a specific theme with a target audience, age group and time to completion.
- Each cube is made from 27 individual ⅛ inch wood blocks.
- Pieces should interlock so that the puzzle cube is self-supported when assembled.
- Should be easy for shipping.

Action Items:

- As a team, design a brief survey to determine who your target audience will be for the puzzle cube. Collect data from at least 12 individuals; e.g. 3 people per team member. The survey could include questions related to a theme for the puzzle cube, level of difficulty and price someone would be willing to pay. The suggested length of the survey is 1 page.
- Upon analyzing the survey results, each member of the team will sketch, design and build a puzzle cube according to the design requirements above. Students will then produce a computer model of their sketch using a 3-D solid modeling program, i.e. Inventor.
- Team members will evaluate their individual designs by testing it out on 10 prospective customers using a survey provided by your instructor.
- Based on a KT Decision Analysis, choose the optimal design for the team using the results from your surveys.

UNIVERSITY OF NEW HAVEN
Tagliatela College of Engineering

June 11, 2014
TO: EASC1107 Students
FROM: Steve Gobel, Marketing Analyst
SUBJECT: Request for Technical Memo—Testing Puzzle Cube Designs for Customer Awareness

During a marketing meeting, your company has decided to explore new markets for generating revenue and has targeted the toy industry. Preliminary research has shown that puzzles like the Rubik’s Cube® seem to appeal to all ages. You have been asked to lead a team to first identify a market and then develop a puzzle cube that can compete in that market. There is limited time since your company would like to introduce this product to the market in time for the holiday season. You are not expected to do a Cost-Benefit Analysis at this time; however, specifying a selling price is expected. In three weeks, you need to pitch your team’s idea to the Director of New Product Development, Mr. DeHart, so he can make a recommendation to the company’s investors.

Design criteria for the puzzle cube and action items appear below. To expedite the design process, each member of your team will design a puzzle cube based on the listed criteria. Your team will collect data for each puzzle before choosing which design to pitch to Mr. DeHart.

Design Criteria

- Each puzzle design must have a specific theme with a target audience, age group and time to completion.
- Each cube is made from 27 individual ¼ inch wood blocks.
- Pieces should interlock so that the puzzle cube is self-supported when assembled.
- The puzzle must be easy to ship.

Action Items:

- As a team, gather data on a potential market by interviewing at least 15 individuals. Draft a survey that includes questions related to a theme for the puzzle cube, level of difficulty and price someone would be willing to pay. Go out there and see how many people you can speak to about puzzle cubes!
- Analyze the data you gather to determine a theme, age group and level of difficulty for your team to focus on to design the puzzle cube.
**DEVELOPMENT OF RUBRICS**

- Specific to assignment
- Student and Instructor versions
- Still under development

### Rubric Details

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Points Possible</th>
<th>Performance Level</th>
<th>Pts. Earned</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Quality of Memo</td>
<td>20</td>
<td>16 - 20 pts</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>13 - 15 pts</td>
<td>0</td>
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<tr>
<td></td>
<td></td>
<td>0 - 11 pts</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Heading</td>
<td>5</td>
<td>3-4 pts</td>
<td>0</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>0 pts</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Summary Paragraph</td>
<td>15</td>
<td>8 - 11 pts</td>
<td>0 - 7 pts</td>
<td></td>
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<td></td>
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</tbody>
</table>

**Notes:**
- Points Possible: Indicates the total number of points that can be earned in that category.
- Points Earned: Indicates the total number of points actually earned in the given category.
<table>
<thead>
<tr>
<th>Dimension</th>
<th>Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Quality of Memo (20%)</td>
<td>• Organized paragraphs.</td>
</tr>
<tr>
<td></td>
<td>• Precise &amp; consistent terminology.</td>
</tr>
<tr>
<td></td>
<td>• Proper use of units and notation; e.g. ml. not milliliters</td>
</tr>
<tr>
<td>Heading (5%)</td>
<td>• Complete heading according to guidelines.</td>
</tr>
<tr>
<td></td>
<td>• Includes date, recipient, sender (author), and subject line.</td>
</tr>
<tr>
<td></td>
<td>• Precise and meaningful subject line.</td>
</tr>
<tr>
<td>Summary Paragraph (15%)</td>
<td>• Concisely addresses readers’ questions.</td>
</tr>
<tr>
<td></td>
<td>• Rephrases the primary question as a statement to open the memo, followed by secondary questions/results and important conclusions.</td>
</tr>
<tr>
<td>Relevant Background (20%)</td>
<td>• Discusses engagement of customers via initial survey for determining design criteria.</td>
</tr>
<tr>
<td></td>
<td>• Summarizes survey results.</td>
</tr>
<tr>
<td></td>
<td>• Discusses design criteria and constraints.</td>
</tr>
<tr>
<td></td>
<td>• Describes individual puzzle cube design.</td>
</tr>
<tr>
<td></td>
<td>• Explains 3-D solid modeling drawings of individual puzzle cube design.</td>
</tr>
<tr>
<td>Analysis of Puzzle Cube Designs (10%)</td>
<td>• Explains testing of prototype puzzle cube.</td>
</tr>
<tr>
<td></td>
<td>• Summarizes and discusses survey data collected from testing prototype puzzle cube.</td>
</tr>
<tr>
<td></td>
<td>• Discusses statistical analysis of survey results.</td>
</tr>
<tr>
<td></td>
<td>• Explains the use of KT Decision Analysis for choosing puzzle cube design.</td>
</tr>
<tr>
<td>Recommendations (10%)</td>
<td>• Recommendations based on data presented.</td>
</tr>
<tr>
<td></td>
<td>• Defines appropriate information to market puzzle cube.</td>
</tr>
<tr>
<td></td>
<td>• Comments on whether modifications are needed in puzzle cube design for marketability.</td>
</tr>
</tbody>
</table>

**STUDENT ADVICE/GRADING TABLE**

<table>
<thead>
<tr>
<th>Overall Grade</th>
<th>Percent</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Memo</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>Isometric handsketch of all puzzle segments</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Orthographic drawing for each part properly dimensioned</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Drawing of assembled and exploded view of cube with part list</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Data collected of pre- and post-customer surveys</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Statistical analysis of data</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>KTDA (used to select recommended cube)</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Photographs of cubes</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Pitching your cube</td>
<td>6%</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL GRADE** 100%
PITCH – Core Competencies

a. Use appropriate format and content;

c. Demonstrate appropriate organization, level of detail, style and tone for a given audience, situation and purpose;

e. Highlight or identify critical information;

f. Present, discuss, and summarize data accurately and persuasively;

g. Write thoughtful and persuasive conclusions and recommendations;
DISPLAYS OF DATA

Targeted PITCH Courses

EASC1112: Methods of Engineering Analysis

EASC3345: Applied Engineering Statistics

CHME4497 & 4498 (senior design)
Proposal, Status Reports, Senior design Report, Poster, Oral Presentation

CHME3311 & CHME4411
Memos, Data Displays, Oral Presentations, Lab Reports

EASC3345
Memos & Data Displays

CHME2220
Memos, Resumes

EASC2211
Memos & Data Displays

EASC1107
Technical Memos

EASC1109
Oral Presentations

EASC1112
Data Displays

CHME2220
Memos, Resumes

EASC1107
Technical Memos

EASC1109
Oral Presentations

EASC1112
Data Displays

CHME4497 & 4498 (senior design)
Proposal, Status Reports, Senior design Report, Poster, Oral Presentation

CHME3311 & CHME4411
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EASC3345
Memos & Data Displays

CHME2220
Memos, Resumes

EASC2211
Memos & Data Displays

EASC1107
Technical Memos

EASC1109
Oral Presentations

EASC1112
Data Displays
DISPLAYS OF DATA

The Need
**Student Assignment:**
Create a plot showing the calculated values of velocity and Reynold’s Number for a gas flowing in a pipe, at fixed volumetric flowrate.

**DISPLAYS OF DATA**

The Need: An Example
Principles of Analytical Design¹:

1. Show comparisons, contrast and differences
2. Show causality, mechanism, explanation, systematic structure
3. Show multivariate data; that is show more than one or two variables
4. Completely integrate words, numbers, images, diagrams
5. Documentation: Thoroughly describe the evidence.
6. Content counts most of all. Analytical presentations ultimately stand or fall depending on the quality, relevance and integrity of the evidence.

¹ Tufte, Edward R., Beautiful Evidence, Graphics Press LLC, Cheshire, CT, 2006; www.edwardtufte.com
DISPLAYS OF DATA

Mini Exercise
DISPLAYS OF DATA

Use guidelines to critique this plot
Formatting should help bring out the message the author wants to deliver by showing data.

Formatting must never distract from the message.
### Typical Components of a Table

- Table Number
- Table Title
- Headings (column, row)
- Table Body
- Notes to Tables

### Displays of Data

Guidelines for Tables

**Table 1: Sheet Metal Properties for Gauge 30**

<table>
<thead>
<tr>
<th>Metal</th>
<th>Thickness (inches)</th>
<th>Weight Per Area (lb/ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>0.0120</td>
<td>0.490</td>
</tr>
<tr>
<td>Galvanized Steel</td>
<td>0.0157</td>
<td>0.640</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>0.0125</td>
<td>0.520</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.0100</td>
<td>0.141</td>
</tr>
</tbody>
</table>

**Note:** Sheet metal thickness gauge for steel is based on weight 41.82 pounds per square foot per inch of thickness.
Guidelines for Tables

**Table Content and Usage**

- Practice information integrity and efficiency
- Provide clear table title and headings
- Verify that elements included in the table are relevant to the narrative.
# Displays of Data

## Guidelines for Tables

**Table 2** Inspection Cost Comparison for Three Inspection Alternatives

<table>
<thead>
<tr>
<th>Sampling Inspection</th>
<th>No Inspection</th>
<th>100% Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n \cdot I + \frac{(N-n) \cdot p \cdot A + (N-n) \cdot (1-P_a) \cdot I}{N} )</td>
<td>( N \cdot P_a \cdot A )</td>
<td>( N \cdot I )</td>
</tr>
<tr>
<td>0.005</td>
<td>0.956</td>
<td>38</td>
</tr>
<tr>
<td>0.01</td>
<td>0.863</td>
<td>43</td>
</tr>
<tr>
<td>0.02</td>
<td>0.648</td>
<td>50</td>
</tr>
<tr>
<td>0.03</td>
<td>0.467</td>
<td>52</td>
</tr>
<tr>
<td>0.04</td>
<td>0.334</td>
<td>52</td>
</tr>
<tr>
<td>0.05</td>
<td>0.24</td>
<td>50</td>
</tr>
<tr>
<td>0.06</td>
<td>0.173</td>
<td>48</td>
</tr>
<tr>
<td>0.07</td>
<td>0.126</td>
<td>45</td>
</tr>
<tr>
<td>0.08</td>
<td>0.093</td>
<td>45</td>
</tr>
<tr>
<td>0.09</td>
<td>0.068</td>
<td>41</td>
</tr>
<tr>
<td>0.1</td>
<td>0.05</td>
<td>39</td>
</tr>
</tbody>
</table>

**Note:** 
- \( N = 5,000 \)
- \( A = $6.50 \)
- \( I = $0.45 \)

Sampling Inspection = \( [n \cdot I + (N-n) \cdot p \cdot A + (N-n) \cdot (1-P_a) \cdot I] \)

No Inspection = \( [N \cdot P_a \cdot A] \)

100% Inspection = \( [N \cdot I] \)

**Appropriate labeling including units of measurement where appropriate**

- **Sufficient space between columns data to be distinct**
- **Highlighted critical information**

**Table 2** Inspection Cost

<table>
<thead>
<tr>
<th>Sampling Inspection</th>
<th>No Inspection</th>
<th>100% Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n \cdot I + \frac{(N-n) \cdot p \cdot A + (N-n) \cdot (1-P_a) \cdot I}{N} )</td>
<td>( N \cdot P_a \cdot A )</td>
<td>( N \cdot I )</td>
</tr>
<tr>
<td>0.005</td>
<td>0.956</td>
<td>38</td>
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<tr>
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</tbody>
</table>

**Note:** 
- \( N = 5,000 \)
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Sampling Inspection = \( [n \cdot I + (N-n) \cdot p \cdot A + (N-n) \cdot (1-P_a) \cdot I] \)

No Inspection = \( [N \cdot P_a \cdot A] \)

100% Inspection = \( [N \cdot I] \)

**Detailed information in notes**

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**Understanding the information presented is difficult due to poor formatting and poor practice of information efficiency.**
Typical Structure & Components of a Plot
with emphasis on XY (scatter) Plots

- Figure Number & Figure Title (plot in document)
- Plot Title
- Axis Labels
- Axis Numeric Scale
- Axis Number Format
- Legends
- Plot Symbols and Lines
- Grid Lines (major/minor)

Guidelines include
- Issues and Advice
- Examples

DISPLAYS OF DATA

Guideline for Plots

This plot uses symbols to represent the experimental values and a smooth curve to show values calculated from an equation that relates the dependent to the independent variable. Note the intent here is to show contrast between experimental and predicted values.
### DISPLAYS OF DATA

Integration into Courses

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Report</td>
<td>• Structure your report in a clear, easy to follow format</td>
</tr>
<tr>
<td>(10%)</td>
<td>• Use correct statistical terminology</td>
</tr>
<tr>
<td></td>
<td>• Include data important to your discussion within the text, give complete</td>
</tr>
<tr>
<td></td>
<td>data information in an appendix with a brief note to that effect as the</td>
</tr>
<tr>
<td></td>
<td>text</td>
</tr>
<tr>
<td></td>
<td>• Provide references for the source of any information in your work that</td>
</tr>
<tr>
<td></td>
<td>is not yours such as data obtained from other sources</td>
</tr>
<tr>
<td></td>
<td>• Provide your report in one document prepared using word processor software</td>
</tr>
<tr>
<td></td>
<td>• Prepare all visual data displays included in your submission in Minitab</td>
</tr>
<tr>
<td>Memo Format</td>
<td>• Include the following structure in your memo:</td>
</tr>
<tr>
<td>(10%)</td>
<td>o a heading: includes the recipient, the sender (author), the subject,</td>
</tr>
<tr>
<td></td>
<td>and the date</td>
</tr>
<tr>
<td></td>
<td>o a summary paragraph: presents a summary of the entire memorandum, reports</td>
</tr>
<tr>
<td></td>
<td>the most significant results</td>
</tr>
<tr>
<td></td>
<td>o a main body: provides more detailed results including visual displays</td>
</tr>
<tr>
<td></td>
<td>o a concluding paragraph: includes summary of the major points.</td>
</tr>
<tr>
<td></td>
<td>o an appendix: includes extreme detail such as tables of raw data, the</td>
</tr>
<tr>
<td></td>
<td>full set of values, etc.</td>
</tr>
<tr>
<td>Descriptive</td>
<td>• Compute all relevant descriptive statistics</td>
</tr>
<tr>
<td>Statistics</td>
<td>• Include computer outputs (if calculated by software)</td>
</tr>
<tr>
<td>(20%)</td>
<td>• Include formulas and calculations steps (if calculated manually)</td>
</tr>
<tr>
<td>Visual Data</td>
<td>• Use clear headings to identify purpose</td>
</tr>
<tr>
<td>Displays</td>
<td>• Label the plot (meaningful title, properly labeled axis including units)</td>
</tr>
<tr>
<td>(Histogram and</td>
<td>• Include meaningful and easy to understand legend if needed</td>
</tr>
<tr>
<td>Probability Plot)</td>
<td>• Include a descriptive caption for all visual data display</td>
</tr>
<tr>
<td>(20%)</td>
<td>• Compute all relevant probabilities</td>
</tr>
<tr>
<td>Probability</td>
<td>• Include computer outputs (if calculated by software)</td>
</tr>
<tr>
<td>Calculations</td>
<td>• Include formulas and calculations steps (if calculated manually)</td>
</tr>
<tr>
<td>(20%)</td>
<td>• Discuss results of your data analysis to formulate a conclusion</td>
</tr>
<tr>
<td>Interpretation</td>
<td>• Provide appropriate numerical summaries and their discussion</td>
</tr>
<tr>
<td>&amp; Justification</td>
<td>• Include appropriate interpretation of visual displays</td>
</tr>
<tr>
<td>(20%)</td>
<td>• Justify your explanations through your visual data displays and/or</td>
</tr>
<tr>
<td></td>
<td>numerical summaries</td>
</tr>
<tr>
<td></td>
<td>• Specify clearly any assumptions that you make</td>
</tr>
</tbody>
</table>
DISPLAYS OF DATA
Integration into Courses
DAVID ADAMS

PITCH Consultant
COPE is an acronym for Clarity, Organization, Precision and Economy. Results of faculty/employer/alumni surveys highlighted these qualities as critical and desirable in engineering communication. COPE: A Technical Writing Guide for Engineers embodies these qualities in 14 guidelines.
THE 14 COPE GUIDELINES; EACH GUIDELINE INCLUDES EXAMPLES AND REVISIONS

Clarity
- C1. Maintain a Flow of Related Words
- C2. Use Parallel Constructions
- C3. Use Pronouns with Care
- C4. Use Consistent Terminology

Organization
- O1. Group and Order Information
- O2. Use Forecast & Echo Structures
- O3. Use Lists and Text Tables
- O4. Design for Complexity & Length

Precision
- P1. Use Exact Terminology
- P2. Use Modifiers with Care
- P3. Fix and Develop the Line of Reasoning

Economy
- E1. Cut Unnecessary Words
- E2. Use Strong Verbs
- E3. Make Good Decisions about Active/Passive Voice
A QUICK EXERCISE IN APPLYING A COPE GUIDELINE

The handouts include an excerpt from the COPE booklet and a brief passage for review and revision. Let’s see how you do in a six-minute revision exercise.
3.0 RESEARCH GOALS AND METHODS

The main premise of this proposal is that, through appropriate implementation of recent advances in information, communication, and computing technologies, it is possible to design more intelligent traffic control. The primary goal of this research is to determine what improvements can be realized if we add speed as a signal control parameter rather than considering speed as a fixed link attribute.
The main premise of this proposal is that it is possible to design more intelligent traffic control through appropriate implementation of recent advances in information, communication, and computing technologies. The primary goal of this research is to determine what improvements can be realized if we add speed as a signal control parameter rather than considering speed as a fixed link attribute. (61 words)
CLARITY: A COPE TUTORIAL

C.1 Maintain a Flow of Related Words

Narrated by Prof. Nadiye Erdil

(Click on each slide to advance to the next.)
PLACE SUBJECTS AND VERBS IN PROXIMITY

You can add clarity to your writing if you avoid putting a large number of words between the subject and verb. The passage that follows violates this guideline. We highlight the problem and then show you how you might revise the passage.
HERE IS A PASSAGE THAT VIOLATES THIS GUIDELINE

Here is the original version.

- A synthetic bone material, in order to withstand a load equal to or greater than that of the bone being replaced, must have mechanical properties that mimic the function and ability of human bone tissue.

Here is the problem.

- A synthetic bone material in order to withstand a load equal to or greater than that of the bone being replaced, must have mechanical properties that mimic the function and ability of human bone tissue.
A synthetic bone material **in order to withstand a load equal to or greater than that of the bone being replaced**, must possess mechanical properties that mimic the function and ability of human bone tissue.

**In order to withstand a load equal to or greater than that of the bone being replaced**, a synthetic bone material **subject** must possess **verb** mechanical properties that mimic the function and ability of human bone tissue.
A second possible revision...

A synthetic bone material [subject] must possess [verb] mechanical properties that mimic the function and ability of human bone tissue in order to withstand a load equal to or greater than that of the bone being replaced.

But does this revision really provide greater clarity?

This version does bring the subject and verb close together, but moving the modifying phrase to the very end makes it harder to link the subject and the load requirement.
IN SUMMARY…

- Writers must often consider the order of words in a sentence. A poor choice in that regard can complicate a reader’s ability to follow the precise meaning in a passage.

- If word order in a sentence is unclear, readers may try to mentally rearrange the ideas (which is really the writer’s job), or they might just miss some important relationship. When such issues show up repeatedly in a longer report, they really make the readers’ task more difficult and may even discourage or annoy them.

- Following this guideline is a matter of recognizing patterns of words, and choosing the pattern that makes the passage clear. Engineers are supposed to be good at pattern recognition, so this guideline should be easy to follow.
SAMUEL DANIELS
Associate Professor of Mechanical Engineering
Tagliatela College of Engineering
University of New Haven
3rd Year Lab Reports: A work in progress.

Process

- Faculty from chemical, civil, mechanical, systems, electrical, and computer engineering and physics are developing a common structure for 3rd year lab reports.
- Each discipline will develop supporting documents matching common structure maintaining consistency across disciplines.

LABORATORY REPORTS IN 3RD YEAR COURSES

Building Consensus for Common Guidelines
LABORATORY REPORTS IN 3RD YEAR COURSES

Building Consensus for Common Guidelines: Current Status

- Common lab report format – Completed (See handout)
- Supporting documents (discipline specific)
  - Assignments sheets – Next step, Fall term
  - Grading rubrics
  - Advice tables
  - Annotated “Model” reports for students
Presumption: Engineering disciplines do NOT have a common lab report format.

Different types of documents
- Hypothesis testing
- Project Reports
- System Design
- Data Analysis

Different Content Areas
- Executive Summaries
- Letters of Transmittal
- Abstracts, Methods & Materials, Equipment List, ...

Goal: Unify reporting format with optional sections selected for each type of document needed.
1. Instructors for 3rd Year lab/design courses selected to form the team.

2. Propose common lab report components making inclusion in specific report format optional.

3. Characterize each lab component collectively to share among disciplines and establish common language.

4. Build agreement on which components fit into three standard report categories:
   - Data acquisition & Analysis
   - Project or System Design
   - Hypothesis Testing
Meeting were ALL “Face to Face”
A respected Arbiter resolves differences
Include Physics & Chemistry!!
Be prepared for LONG discussions
Build understanding of different views of what each component is.

Excerpts, Executive Summary discussions

Difficulty Scheduling – “Coffin nails”
### Laboratory Reports in 3rd Year Courses

**Building Consensus for Common Guidelines**

<table>
<thead>
<tr>
<th>Sections</th>
<th>ME, CE, ChemE</th>
<th>EE, CPE, SYS</th>
<th>SYS, PHYSICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter of Transmittal</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Cover Page</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Abstract</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Introduction</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Literature Review</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Methods and Materials</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Data and Results</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Discussion</td>
<td>✓</td>
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<td>✓</td>
</tr>
<tr>
<td>Works Cited</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Appendices</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
The “common” lab report format handout includes a description of each section.

Continue lab report team meetings to develop:
- Assignments sheets
- Grading rubrics
- Advice tables
- Annotated “model” reports for students

Maintain communication to assure a common presentation to students. These are “College” standards.

QUESTIONS?
DAVID HARDING

Professor of Chemical Engineering
Tagliatela College of Engineering
University of New Haven

American Society for Engineering Education Annual Conference--Indianapolis Indiana: June 15, 2014
Five PITCH elements in the senior design sequence

Three unique PITCH elements in senior design

Design Proposal
Design Poster
Design Report
Progress Reports
Oral Presentations

PITCH IN SENIOR DESIGN

Overview of PITCH elements in the senior design sequence.
DESIGN PROPOSAL DOCUMENT

Overview of the Design Proposal Document
- Design proposal elements
- Design proposal guidelines

These major Design Proposal elements have been agreed upon.
1. Technical Communication Products:
   a) Plan, design and produce letters, and formal reports (proposals).

2. Technical Communication Habits:
   a) Use appropriate format and content;
   b) Exhibit clear, precise and logical expression;
   c) Demonstrate appropriate organization, level of detail, style and tone for a given audience, situation and purpose;
   d) Demonstrate appropriate syntax and correct usage of grammar and spelling;
   e) Highlight or identify critical information;
   h) Work effectively to produce multi-author communications.
Development of design proposal guidelines
- Initial outline with possible elements provided by David Adams – summer 2013
- Initial meeting with representatives from each program – August 2013
- Draft TCoE design proposal guidelines
- Second meeting with representatives from each program – October 2013
- Second draft TCoE design proposal guidelines
- Third meeting with representatives from most programs – November 2013
- Final draft TCoE design proposal guidelines

DEVELOPMENT OF THE DESIGN PROPOSAL GUIDELINES

Process of development of design proposal

Built consensus to develop a common document for use by seven programs
Design Proposal Guidelines
- Final guidelines, implement fall 2014
- Advice table and grading rubrics under development (12/14)

Poster Presentations
- Guidelines and grading rubric being revised
- Advise table under development (5/15)

Design Reports
- Beginning process to build consensus
- Development of common guidelines
- Advice table and grading rubrics to be developed
## PITCH IN SENIOR DESIGN

PITCH Elements in the Senior Design Sequence by Program

<table>
<thead>
<tr>
<th>Program</th>
<th>Proposal</th>
<th>Status Reports</th>
<th>Final Project Report</th>
<th>Poster</th>
<th>Oral Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Engineering</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>[1]</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>System Engineering</td>
<td>1</td>
<td></td>
<td></td>
<td>(1)</td>
<td>1</td>
</tr>
<tr>
<td>Computer Science</td>
<td>Vision Statement</td>
<td>Documentation - UML</td>
<td>Users Manual</td>
<td>1</td>
<td>Proof of Concept</td>
</tr>
</tbody>
</table>

American Society for Engineering Education Annual Conference--Indianapolis Indiana: June 15, 2014
www.newhaven.edu/engineering/PITCH/

- Student Resources: Contains advice tables and guidelines
- Faculty Resources: Contains this presentation and some other links
PITCH CONTACTS

Please contact workshop presenters for further information about PITCH, its design, its implementation, and all the speed bumps along the way.

- Ron Harichandran [rharichandran@newhaven.edu]
- Jean Nocito-Gobel [jnocitogobel]
- Mike Collura [mcollura]
- Nadiye Erdil [nerdil]
- David Adams: djadams46@att.net
- Sam Daniels [sdaniels]
- David Harding [dharding]

American Society for Engineering Education Annual Conference--Indianapolis Indiana: June 15, 2014
ACKNOWLEDGEMENTS

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QUESTIONS?