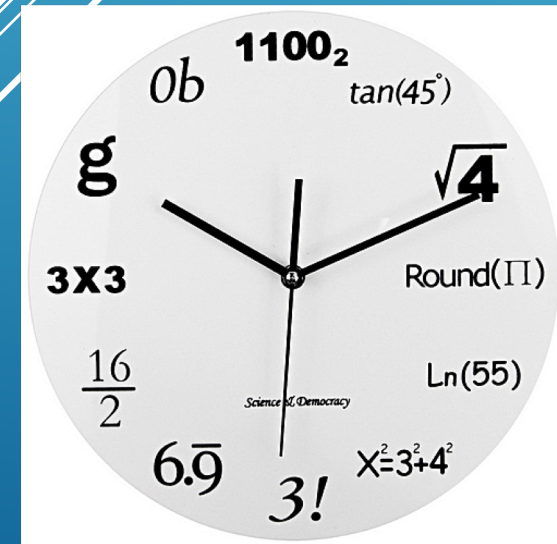


# ENGINEERING COMMUNICATION (BE UNDERSTOOD)

ME 481 Senior Design I

Fall 2019

Dr. Zhuoyuan Song



# Why Is Communication Important?

*“Ineffective communications is the primary contributor to project failure **one third** of the time, and had a negative impact on project success **more than half the time.**”*

-- Project Management Institute (PMI)

“Examination of the public documents available on the Challenger exploration shows that a history of miscommunication contributed to the accident. This miscommunication was caused by several factors, including managers and engineers interpreting data from different perspectives....”

“Communication, then, is not just shared information; it is shared interpretation.”

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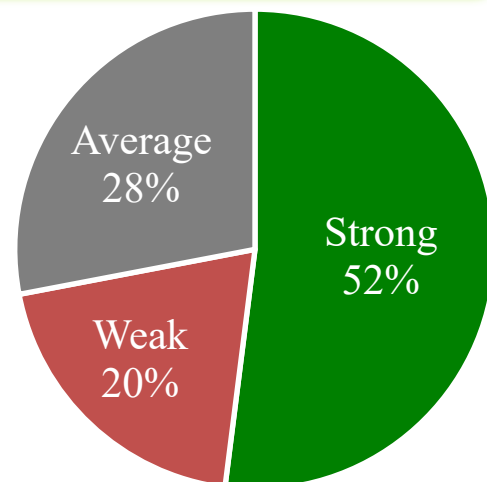
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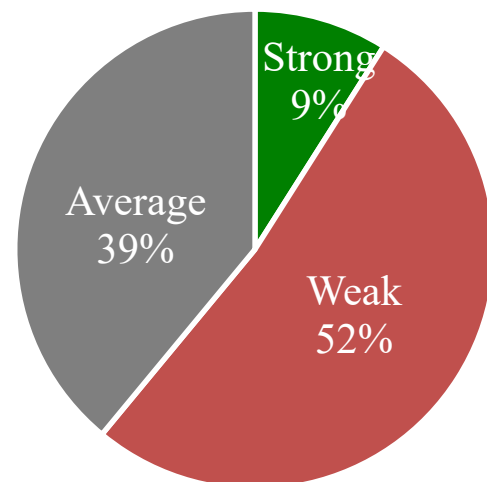
and

# How Are We Doing?

“52% of mechanical engineering department heads considered the written and oral communication skills of their mechanical engineering graduates to be strong, while only 20% considered these skills to be weak....



... a parallel survey of industry representatives found almost opposite results, with only 9% considering the communication skills of recent mechanical graduates to be strong and 52% considering those same skills to be weak. ”



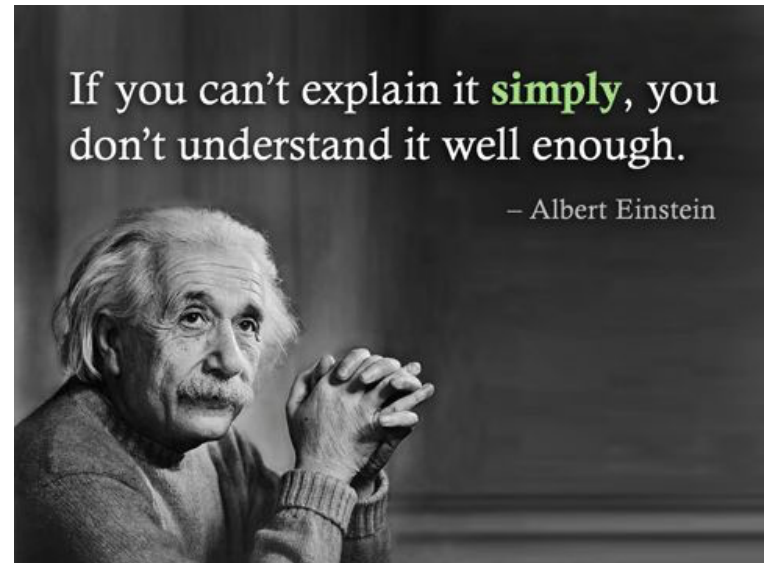
-- J.A. Donnell et al., “Why Industry Says That Engineering Graduates Have Poor Communication Skills: What the Literature Says”, *American Society for Engineering Education (ASEE)*, 2011.

# Effective Communication Basis

Effective communication demands what is written or said to be:

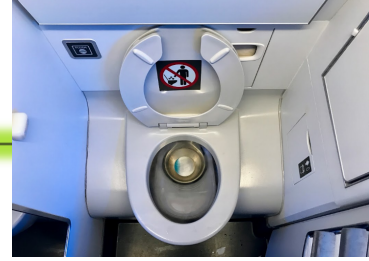
- Direct
- Accurate
- Clear
- Simple
- Without ambiguity\*

Difficulty



<https://www.exkalibur.com>

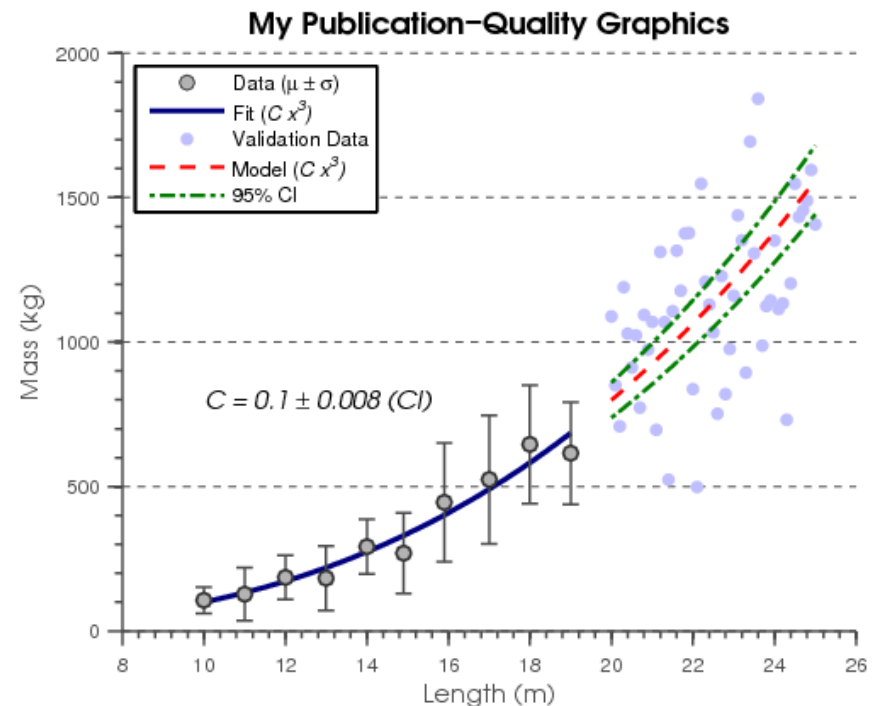
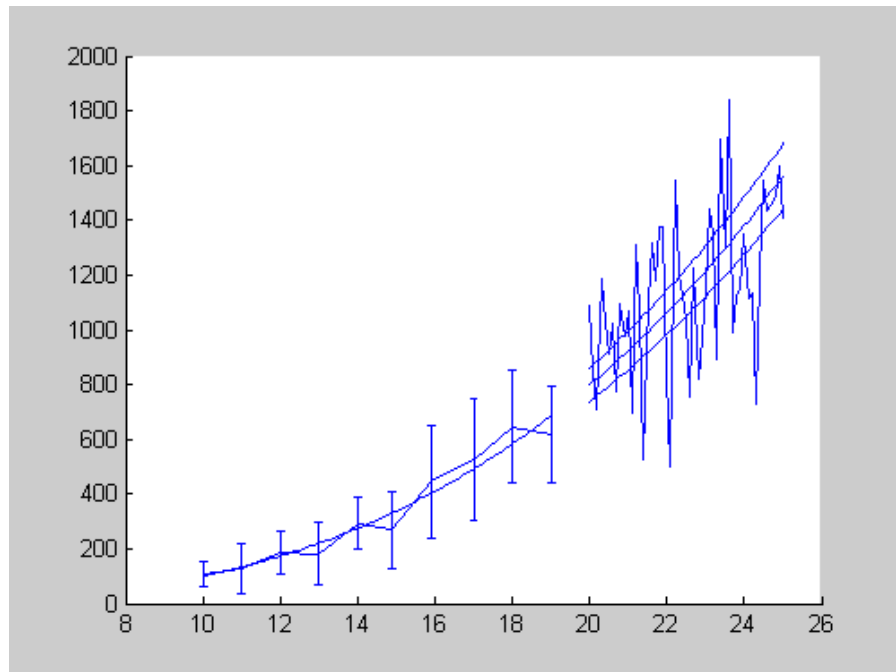
# Example: Airplane Lavatory



- “Discarding anything other than toilet tissue in the toilet can cause external leaks and create a safety hazard.”
- “Please use the trash container for anything other than toilet tissue.”
- “Please do not deposit any article in toilet.”
- “Do not put any article in toilet.”
- “Please do not throw towels, cups, sanitary napkins, bottles, razor blades, objects in toilet.”
- “Do not throw paper towels, sanitary napkins, diapers, cups, bottles, other items in toilet.”
- “Please do not throw foreign objects in flushing toilet”
- **“Please do not put objects such as air sickness bags, diapers, or towels in toilet.”**

-- Jean H. Dawson, *Examples of good and bad technical writing*, 1994.

# Example: Plots



Loren Shure, MathWorks

# Outline

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- Definite of Communication
- Technical (scientific) writing
- Oral presentation

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What is the most  
important factor in  
*Communication?*



# Definition of Communication

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- “A process by which information is **exchanged** between **individuals** through a **common** system of symbols, signs, or behavior.”

-- Merriam-Webster

# Core of Communication

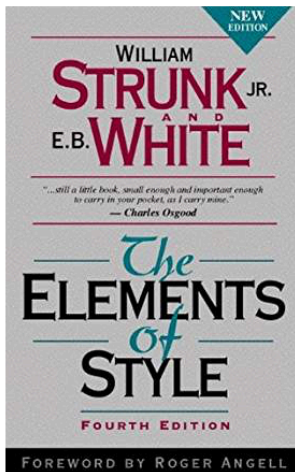
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- “The fundamental purpose of *scientific discourse* is **not** the mere presentation of information and thought, **but rather** its actual communication.”
- “It **does not matter** how pleased an author might be to have converted all the right data into sentences and paragraphs; it **matters only** whether a large majority of the reading AUDIENCE accurately perceives what the author had in mind.”

-- G.D. Gopen and J.A. Swan, *American Scientist* (Nov-Dec 1990), Volume 78, 550-558

# Technical Writing

Best Seller



## The Elements of Style, Fourth Edition

by [Strunk Jr., William](#), E. B. White, et al. | May 25, 2019

★★★★★ ∨ 1,856

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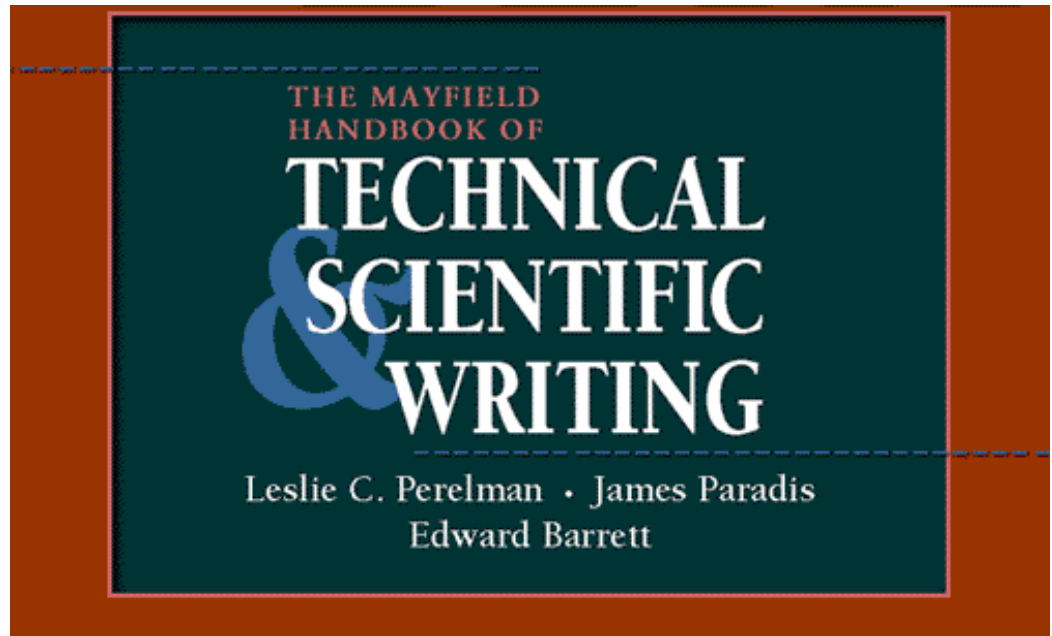
## Writing Resources

- General Writing
  - [The Mayfield Handbook of Technical and Scientific Writing](#)
  - [Technical Writing Guides](#)
  - [Quick Report Writing Tips](#) (conventions, “four” or “4” ?, First, then, finally, equations, figures, tables, etc)
  - [MIT 2.671 presentation on technical writing](#)
  - [MIT LibGuide on Fair Use](#)
  - [“Engineering Communication” Lecture \(2018.09.12\)](#)
  - [“Technical Communication – Writing” Lecture \(2017.09.06\)](#)
- Style Guides
  - [Design notebook guidelines form Dieter](#)
  - [ASME References Style Guide](#)
  - [ASME Journal Paper Formatting Rules](#) (font, borders, etc)
  - [NIST Checklist for unit usage in manuscripts](#)
- Background Research/Literature Surveys
  - [Quick Start Suggestions from Librarian Presentation \(2018.09.10\)](#)
  - [Mechanical Engineering Library Research Home Page](#)
  - [ME481 Literature Research Page](#)
- Examples
  - [Journal Article Examples](#)

# POWER

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- Plan
- Organize
- Write
- Edit
- Revise



<http://www.mhhe.com/mayfieldpub/tsw/home.htm>

# Write Ethically!!

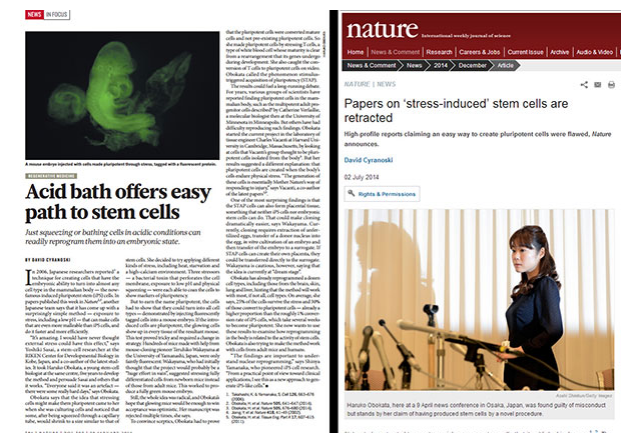
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- Concise and accurate account of work with an objective discussion of its significance
- Sufficient detail and references/resources to repeat the work or otherwise verify its accuracy
- Full, proper citations of all references, sources of information, and/or sources of inspiration
- Not reproduce data or graphics without proper copyright holder approval
- Not plagiarize or falsify

# Example: Hakuro Obokata



- STAP (Stimulus-triggered acquisition of pluripotency)
- “...manipulating the image data of two different gels and using data from two different experiments... Given the poor quality of her laboratory notes it has become clearly evident that it will be extremely difficult for anyone else to accurately trace or understand her experiments, and this, too, is considered a serious obstacle to healthy information exchange....” – *Riken*
- 2 Nature papers retracted
- Ph.D. degree revoked
- Mentor committed suicide
- Resigned from Riken



<http://nexciencia.exactas.uba.ar>

# Write Clearly

---

- Provide all necessary information for the reader to understand
- Define all mathematical symbols immediately before or after their first occurrence
- If you must abb. (abbreviate), define the term in its first occurrence, and put abbreviations in parentheses
- **Figure Caption:** Should provide sufficient information for the reader to understand the figure without referring to the context.
- All figures and tables should be cross-referenced



# Write Precisely

---

- **Key information in the main clause:**
  - “Despite winning the game, the Rainbow Warriors made several errors in the first half.”
  - “Despite making several errors in the first half, the Rainbow Warriors won the game.”
  - **“The Rainbow Warriors won the game, despite making several errors in the first half.”**

-- Nicole Kelley, MIT

# Write Formally

---

- a lot of → much; many
- But... → However, ...
- And... → In addition, ...
- & → and
- It's → It is
- vs. → versus



Formal  
Writing



Informal  
Writing



Emo  
Writing

<https://proofreadingpal.com/>

# Write Concisely

---



- Avoid redundancy:
  - **already** existing; mix **together**; at **the** present **time**;  
**basic** fundamentals; **currently** under way ....
- Avoid writing zeroes (empty phrases):
  - it is my intent to show that; as a matter of fact...
- Avoid near zero phrases:
  - at this point in time (**now**); at that point in time (**then**);  
has the ability to (**can**); in the event that (**if**); in the  
vicinity of (**near**); owing to the fact that (**because**)

# First Person versus Third Person

---

- Chicago Manual of Style:

- “When you need the first person, use it. It's not immodest to use it; it's superstitious not to.”
- Avoiding the first person used to be considered proper, but now it's considered very formal, if not old-fashioned. It's not a question of correctness, however; both styles are correct. If you feel strongly that the first person is out of place in your work, don't use it.

-- Chicago Style Q&A, December 2010

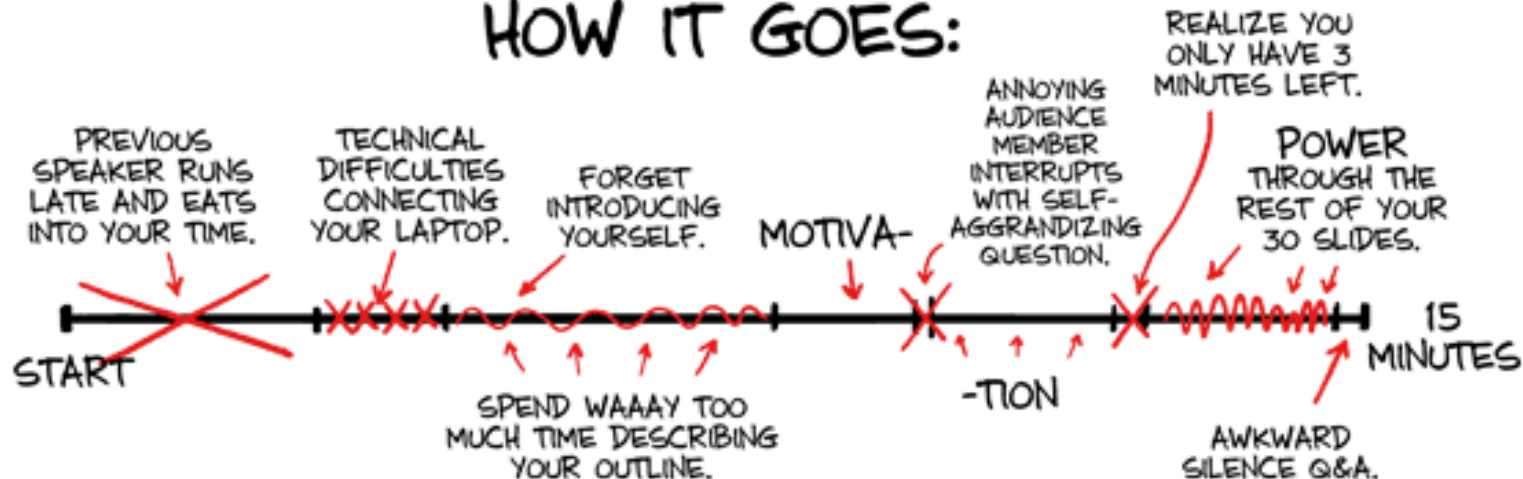
# Oral Presentation



## HOW YOU PLANNED IT:



## HOW IT GOES:



Piled Higher and Deeper by Jorge Cham

# Presentations

- Study your audience
- Use visual aids properly
- Give roadmap before going into details
- Include necessary and sufficient information
- Be on time!
- Practice, practice, and practice more
- All slide contents should be readable



# MATLAB Plot Guides

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- Use **dark colors** for lines/points that will print well in black and white (-----, -----)
- Use line types and point types so the lines are easily distinguishable in **black and white** (....., -----, --.---.---. )
- Use reasonable precision on axis numbers (1.0, 1.5, 2.0 instead of 1.0000, 1.5000, 2.0000)
- Include several axis ticks on each axis (but not too many), this is usually only an issue on logarithmic scales
- Size or crop the final image to closely fit the actual content (no large margins)
- Use consistent font types and sizes
- UNITS! (Consistent metric vs. English)