Chapter 2

Engineering a Presentation

2.1. The student's list could include

- product cost
- product size
- product weight
- power consumption
- reliability
- inspectability
- delivery date
- service life
- legalities (e.g., patent infringement)
- compliance with standards of engineering organizations
- government regulations
- ambient environmental parameters
- safety issues
- disposal issues
- ergonomic factors
- noise emission
- noise susceptibility
- political issues

and many other considerations. Students could be encouraged or required to generate concrete examples. A good resource is the book *Creative Engineering Design* by Brian Thompson (4th ed, 1996).

2.2. There are obviously many possible responses to this exercise. Even the mundane problem

> How can I make this room darker?

has solution alternatives such as

> I could install a dimmer switch.
> I could install a room-darkening shade.
> I could paint the walls a darker color.

2.3. Yes, there is no reason to think that just because you understood something all at once, your listener can or will do the same. A concept that is "intuitive" to one person may not be so to another. It is dangerous to assume instead of carefully communicating.

2.4. Todd could use the engineering design process to his advantage and read the rest of the book *Engineering Speaking by Design* by Rothwell and Cloud.

2.5. Topic: Antennas. In explaining antennas to a lay person, you could answer the following questions:

- Why do we use antennas?
- How do antennas work?
- What are the different types of antennas?
- What makes a good antenna versus a bad antenna?
- How much does a typical antenna cost?

For the chunk on "why do we use antennas?" you could break things into sub-chunks according to use, and give examples:

- to communicate information (radio, TV, wifi)
- to send out a locator beacon (emergency locator, wildlife tracking)
- to send out a beam for detecting objects (military radar, auto parking radar, supermarket door opener)
- to transmit energy to a device (wireless cell phone charger)

- to send out a detection signal (RFID)
- to send energy for heating things up (microwave oven, cancer ablation therapy)

2.6. Additional examples include

- Aim
- Algorithm
- Alternate Route
- Analogy
- Analysis
- Assertion
- Assumption
- Background
- Basis
- Caution
- Claim
- Clarification
- Comment
- Conclusion
- Confirmation
- Convention
- Corollary
- Criterion
- Definition
- Derivation
- Description
- Details

- Detour
- Example
- Fact
- Goal
- Guideline
- Hypothesis
- Idea
- Illustration
- Intent
- Interpretation
- Justification
- Lemma
- Motivation
- Method
- Notation
- Note
- Objective
- Observation
- Pattern
- Plausibility Argument
- Premise
- Principle
- Problem
- Procedure
- Process
- Proof

- Proposition
- Question
- Rationale
- Reason
- Recommendation
- Remark
- Restrictions
- Result
- Rule
- Shortcut
- Solution
- Starting Point
- Steps
- Strategy
- Summary
- Tactic
- Technique
- Test
- Theorem
- Trick
- Typical Case
- Verification
- Warning

2.7. Tables are quite useful for displaying information. Our examples come from electrical engineering, but it's obvious that students could do similar things for any engineering subdiscipline.

Here is a very simple table describing the operation of a digital latch:

S	R	Q
0	0	no change
0	1	0
1	0	1
1	1	(forbidden)

Our next example displays the point forms of Maxwell's equations, the fundamental dynamical equations governing the electromagnetic field:

name	**equation**
Faraday's Law	$\nabla \times \mathbf{E} = -\partial \mathbf{B}/\partial t$
Ampere's Law	$\nabla \times \mathbf{H} = \mathbf{J} + \partial \mathbf{D}/\partial t$
Gauss's Law	$\nabla \cdot \mathbf{D} = \rho_V$
Magnetic Source Law	$\nabla \cdot \mathbf{B} = 0$

Here is a slightly more involved table, providing information about the three coordinate systems commonly used in engineering science courses:

system	**coordinate**	**type**	**permissible range**
rectangular	x	distance	$-\infty < x < \infty$
	y	distance	$-\infty < y < \infty$
	z	distance	$-\infty < z < \infty$
cylindrical	ρ	distance	$0 \leq \rho < \infty$
	ϕ	angle	$0 \leq \phi < 2\pi$
	z	distance	$-\infty < z < \infty$
spherical	r	distance	$0 \leq r < \infty$
	θ	angle	$0 \leq \theta < \pi$
	ϕ	angle	$0 \leq \phi < 2\pi$

Our final example is a bit more text oriented, naming and explaining some of the functional blocks that recur throughout electronics practice.

Name	Role or Purpose
amplifier	increases voltage, current, or power level of signal
attenuator	decreases voltage, current, or power level of signal
filter	selects (and possibly amplifies) certain frequencies in signal
signal source	produces waveforms
wave-shaping circuit	re-shapes waveforms
logic circuit	processes digital signals
memory circuit	stores digital information
power supply	provides dc power to other circuits
a/d converter	changes signal from analog form to digital form
d/a converter	changes signal from digital form to analog form
mixer	multiplies two input signals
summer	adds (or subtracts) two or more input signals
integrator	integrates input signal over time
differentiator	takes time derivative of input signal

2.8. Students could be encouraged to notice many aspects of a potential speaking environment, including

- room size
- seating arrangement
- lighting
- presence or absence of a stage
- presence or absence of a lectern
- presence or absence of an electrical outlet at the speaker's location
- presence or absence of a microphone
- proximity of drinking fountains or restrooms
- locations of emergency exits

Particularly important for engineering presentations is audio-visual (AV) equipment. Most college classrooms probably have have at least some equipment. But one room may have an AV console (cart with a DVD player, computer, monitor, etc.), while another may only have a connection for a laptop to a ceiling-mounted video projector. Certain rooms may still offer projectors for printed material (opaque or transparencies). Some rooms have white boards where the writing can be captured on a computer and on video.

2.9. The student is urged to construct a rubric that is tailored to his or her presentation.