Learner Centered Limits of Presentation Technologies

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Limiting factors for presentations

- Human factors
  - Vision
  - Hearing

- System Factors
  - Projection Device
  - Program Material Display Format
  - Program Material Source Device

- Environmental Factors
  - Temperature
  - Room Geometry
  - Lighting
  - Background Noise
Limits of the Visual Field

- Limits of comfortable head movement

![Diagram of limits of visual field with annotations for color discrimination, symbol recognition, and easy head movement areas.](image-url)
Limits of the Visual Field

- Limits of symbol recognition in the visual field
Human Perception of Form

- What shapes look good to our eye?
- Why is this?
- What is the “Golden ratio”?
- $\phi \approx 1.618$
Proper Font Selection

- What type of fonts look best in presentations?
  - SERIF (Times New Roman)
  - SANS-SERIF (Tahoma)
  - ENGINEERING (Helvetica)
  - FANCY/WEIRD (Corsiva)
  - Sans-Serif fonts were preferred for reading on computers in a University of Wichita study

- How should text be aligned?
  - It depends on the convention of the audience
  - Left align for English speakers
Size of the Projected Image

- How are screens sized?

\[ H = \text{Height of Screen Viewing Area} \]
\[ D = \text{Distance From Screen Surface To Viewer} \]
\[ V^\circ = \text{Vertical Subtended Angle} = 2 \times \tan^{-1} \left( \frac{1}{2}H \div D \right) \]
Distance to Furthest Viewer

\[ V = 6H \] for Classrooms
\[ V = 8H \] for Movies
Size of the Projected Image

- What size screen do we have in 117 Calhoun?

\[
\text{Horizontal Subtended Angle - } H^\circ \\
\text{(Optimum = 30° or More)}
\]

\[
W = \text{Width of Screen Viewing Area} \\
D = \text{Distance From Screen Surface To Viewer} \\
H^\circ = \text{Horizontal Subtended Angle} = 2 \times \tan^{-1}\left(\frac{1}{2} W \div D\right)
\]

Audience Horizontal Subtended Angles
Shape of the Projected Image

- What is aspect ratio?
- Why do movies use other aspect ratios?
Color Perception

- Color Blindness
Deficiency in Color Vision

- Types
  - Red/Green
  - Blue/Yellow
  - Monochromacy

- Prevalence / Impacted Populations
  - Males 8%
  - Females 0.4%
“Normal” Vision

- What is normal 20/20 vision, what does that mean?
- What level of vision should I expect from a normal audience?
- What size text should I use?

Snellen Chart
Calculation of Minimum Font Size

- Distance to farthest viewer should be 6H maximum

- 10’ of subtended arc (1/6°) at a distance of 6H is 0.017H (assuming 20/40 vision)

- 0.017 x 8.5 = 0.1445” => 18 point font

- Conversion: Height in inches x 121.4 = Point Size of Font
Limits of Human Hearing

- What is normal human hearing?
  - Decibel Scale, $20 \log(P/P_{\text{ref}})$
  - Threshold of normal hearing is 0 dB or $P/P_{\text{ref}} = 1$

- Signal to noise ratio (SNR)
  - 15 dB SNR desirable
  - Calhoun 117 Background – 71 dB
  - Normal Voice - 74 dB @ 1 ft, background @ 2 ft
    - Does not achieve 15 dB SNR
  - Loud Voice - 88 dB @ 1 foot, background @ 32+ ft
    - 15 dB SNR out to 2 ft
Causes of Hearing Degradation

- What causes hearing loss? Will my audience be affected?
  - Exposure to excessive sound levels
  - Genetic
  - Disease
  - Medications
  - Age
I can’t hear you!

- When do rooms need speech reinforcement?
  - When SNR is an issue for some of the audience.

- Should I use the microphone?
  - If it is there, you need to use it.
Speakers

- Why do some rooms have speakers at the front, some have speakers in the ceiling, and some have both?
  - Program
  - Speech Reinforcement
Group Discussion / Experience

- Arrange yourselves in groups
- Come up with a list of problems you have had in the past with presentation technology
- Compare the systems you typically use on a regular basis
Typical Presentation Systems

- Projection or Display Device
- Control Device / Interface
- Switching Device
- Video Processing Device / Computer Interface
- Program Source Devices
  - DVD/CD/VCD
  - VCR
Custom Presentation Systems

- Special Equipment
  - Local Dedicated Computer
  - TV/Cable Tuner
  - Satellite Tuner
  - Video Conferencing System
  - Document Camera / Overhead Projector
  - Slide Projector
  - Microphone
  - Audio Processing Equipment
Analog Video Formats

- What are common video formats?
  - NTSC (National Television System Committee)
    - 30 Hz refresh rate
    - 486 Lines in picture
    - 2:1 interlaced
  - PAL (Phase Alternating Line)
    - 25 Hz refresh rate
    - 576 Lines in picture
    - 2:1 interlaced
  - SECAM
    - French Color Standard
HDTV Video Formats

- United States has 3 available formats:
  - 1080p – 1080 lines, progressive scan
  - 1080i – 1080 lines, interlaced scan
  - 720p – 720 lines, progressive scan

- FCC will not chose a winner, market to decide
Video Signals

- Composite Video
  - Single RCA style connector - analog

- Component Video
  - RGB Video – 3 RCA style connectors
  - S-Video – Single s-video connector
  - Digital Component – 3 RCA style Connectors YUV, Y Pb Pr, YCb Cr

- True Digital Video
  - Single DVI connector
  - Single IEEE 1394 (Firewire)
Display Systems

- What are common projection / display technologies?
  - CRT – Cathode Ray Tube - Television
  - LCD – Liquid Crystal Display - Laptop
  - Plasma – Ionized gas gives off colored light - Television
  - DLP – Small mirrors on a chip reflect light - Television, Projectors

- What types of signals look good on which type of display?
Room Thermal Environment

- What is a comfortable temperature?
  - ASHRAE says that complaints are minimized when the temperature is maintained between 72 and 74 degrees, with relative humidity between 30% and 60%
  - Women are more sensitive to temperature
  - Men are more sensitive to humidity

- Remember that the audience’s comfort is more important than your comfort for maximizing their ability to benefit from your lecture

- Some presentation spaces have the HVAC controls as part of the system control interface
Room Geometry-Sightline Study

C’L’G + 9’-6” 6”

HOR. IMAGE 5’-0” × 7’-5”W

INTERFERENCE 10”

4’-0”

BOTTOM OF IMAGE SHOULD BE AT LEAST 4’-0” ABOVE FLOOR TO PREVENT EXCESSIVE HEAD INTERFERENCE.
Light Control

- Window Treatments
  - Blinds / Shades / Curtains
- Zoning
  - Multiple Zones
- Fixture Type
  - Direct and Indirect
  - Incandescent and Fluorescent
- Dimming
  - Presets for presentation activity
Ambient Noise

- What are the sources?
  - HVAC / Building Mechanical System
  - Lights
  - Projection Device
  - Audience
  - Presenter
  - Exterior Noise
Ambient Noise Level

- How is it specified? What should I expect the background level to be?

- What can be done to reduce it in a problem room I have to present in on a regular basis?
  - Ceiling Tile / Acoustical Panels
  - Proper Architectural Design
  - Duct Silencers
  - Projector Enclosure
  - Proper Lighting Design
Calhoun 117 Noise Data

Octave Band Center Frequency (Hz)

- RC 25
- Data
- RC 30
- RC 50

SPL (dB)
Group Discussion / Tips

- Get back into your groups

- Make a list of your best presentation tips to share with the group
Recommendations

- Use sans-serif, simple fonts
- Avoid pastel shades, especially green and red together in graphics
- Use the native device for program materials
- Get to the room early and get familiar with the system
- If there is a microphone, put it on and use it
- Speak up
- Adjust the lights and thermostat
Questions?

Email me for copies of the presentation, or with any feedback.

You will receive an email from the CFT for anonymous feedback, if you prefer.

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Anything you’d care to share would be greatly appreciated.