

MONDAY, MAY 24, 2023

Biomedical Visualization, UIC

STUDENT RESEARCHER

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ADVISOR

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2023 Project Research Defense

# **Utilizing the Assertion Evidence PowerPoint Presentation Style to Promote Meaningful Learning in Anatomy**

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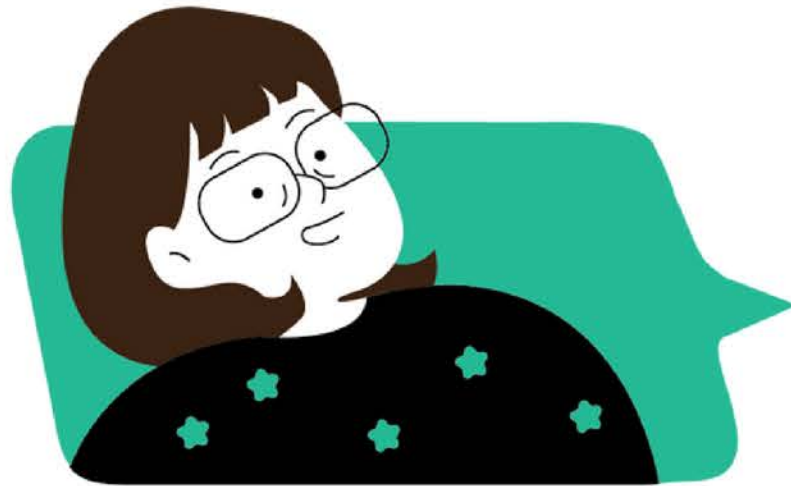
💡 | Introduction

**Meet my committee.**



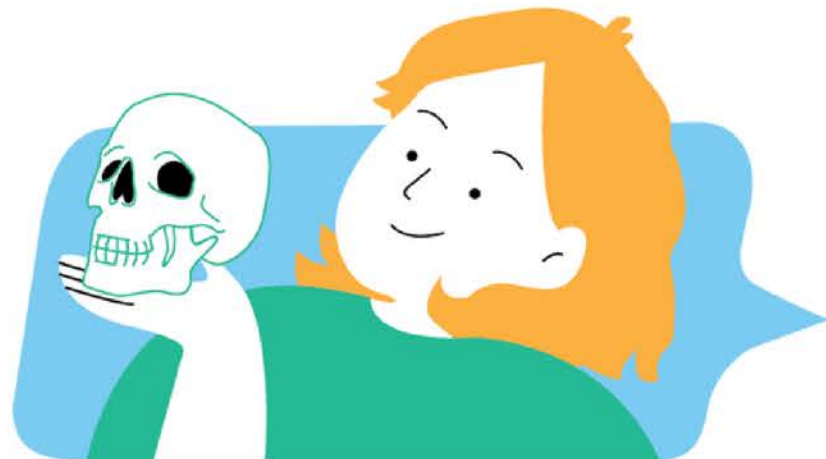
**Kelly Cloninger, MS**

Chair & Research Advisor



**Leah Lebowicz, MS, EdD, CMI**

Committee Member



**Christa Wellman, MAMS**

Committee Member



# I Introduction // Overview of research problem

The standard powerpoint template prompts presenters to make presentations that undermine learning comprehension (Alley, 2005).

**Temperature Concern on SRM Joints**

**27 Jan 1986**

HISTORY OF O-RING DAMAGE ON SRM FIELD JOINTS

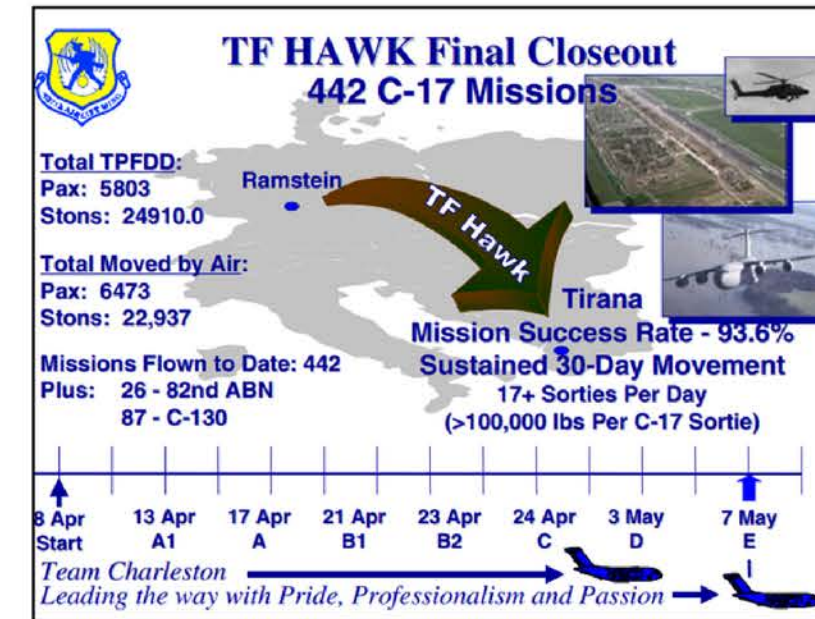
SRM No.	Cross Sectional View			Top View		Clocking Location (deg)
	Erosion Depth (in.)	Perimeter Affected (deg)	Nominal Dia. (in.)	Length Of Max Erosion (in.)	Total Heat Affected Length (in.)	
61A LH Center Field**	22A	NONE	NONE	0.280	NONE	38° - 68°
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51C LH Forward Field**	15A	0.010	154.0	0.280	4.25	163
51C RH Center Field (prim)**	15B	0.038	130.0	0.280	12.50	354
51C RH Center Field (sec)**	15B	None	45.0	0.280	None	29.50
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41C LH Air Field*	11A	None	None	0.280	None	275
410 LH Forward Field	10A	0.040	217.0	0.280	3.00	14.50
STS-2 RH Air Field	28	0.053	116.0	0.280	--	50

\*Hot gas path detected in putty. Indication of heat on O-ring, but no damage.  
 \*\*Soot behind primary O-ring.  
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Clocking rotation of leak check port - 0 deg.

OTHER SRM-15 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY AND NO SOOT HEAR OR BEYOND THE PRIMARY O-RING

SRM-22 FORWARD FIELD JOINT HAD PUTTY PATH TO PRIMARY O-RING, BUT NO O-RING EROSION AND NO SOOT BLOWBY. OTHER SRM-22 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY.



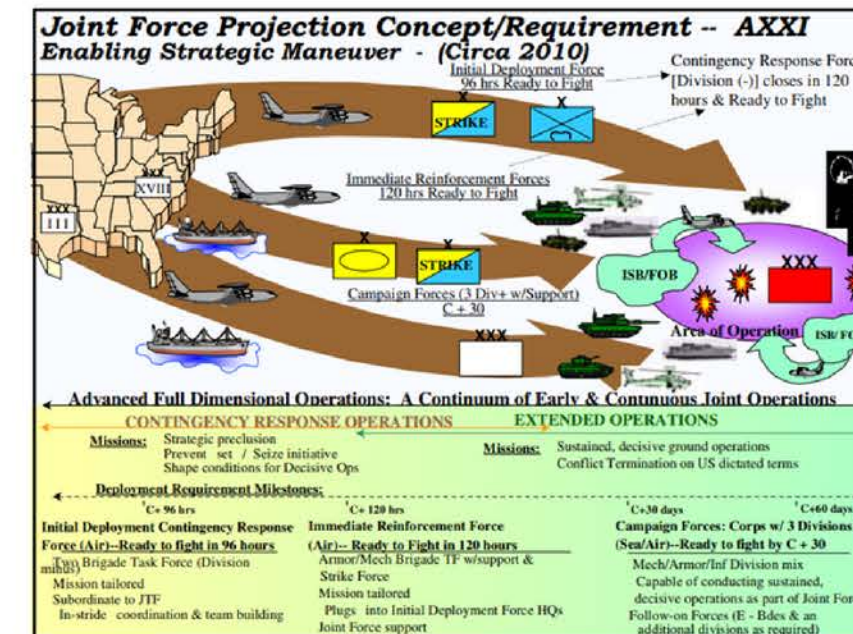
**Literature Review**

Hefner developed a dynamic electro-thermal model for IGBT, from of the temperature-dependent IGBT silicon chip, packages and heat sinks. The temperature-dependent IGBT electrical model describes the instantaneous electrical behavior in terms of the instantaneous temperature of the IGBT silicon chip surface. The instantaneous power dissipated in the IGBT is calculated using the electrical model and determines the instantaneous heat rate that is applied to the surface of the silicon chip thermal model. Hefner incorporated this methodology into the SABER circuit simulator.

Adams, Joshi and Blackburn considered thermal interactions between the heat sources, substrate, and encloses walls as affected by the thermal conductance of the walls and substrate with the intent of determining which physical effects and level of detail are necessary to accurately predict thermal behavior of discretely heated enclosures.

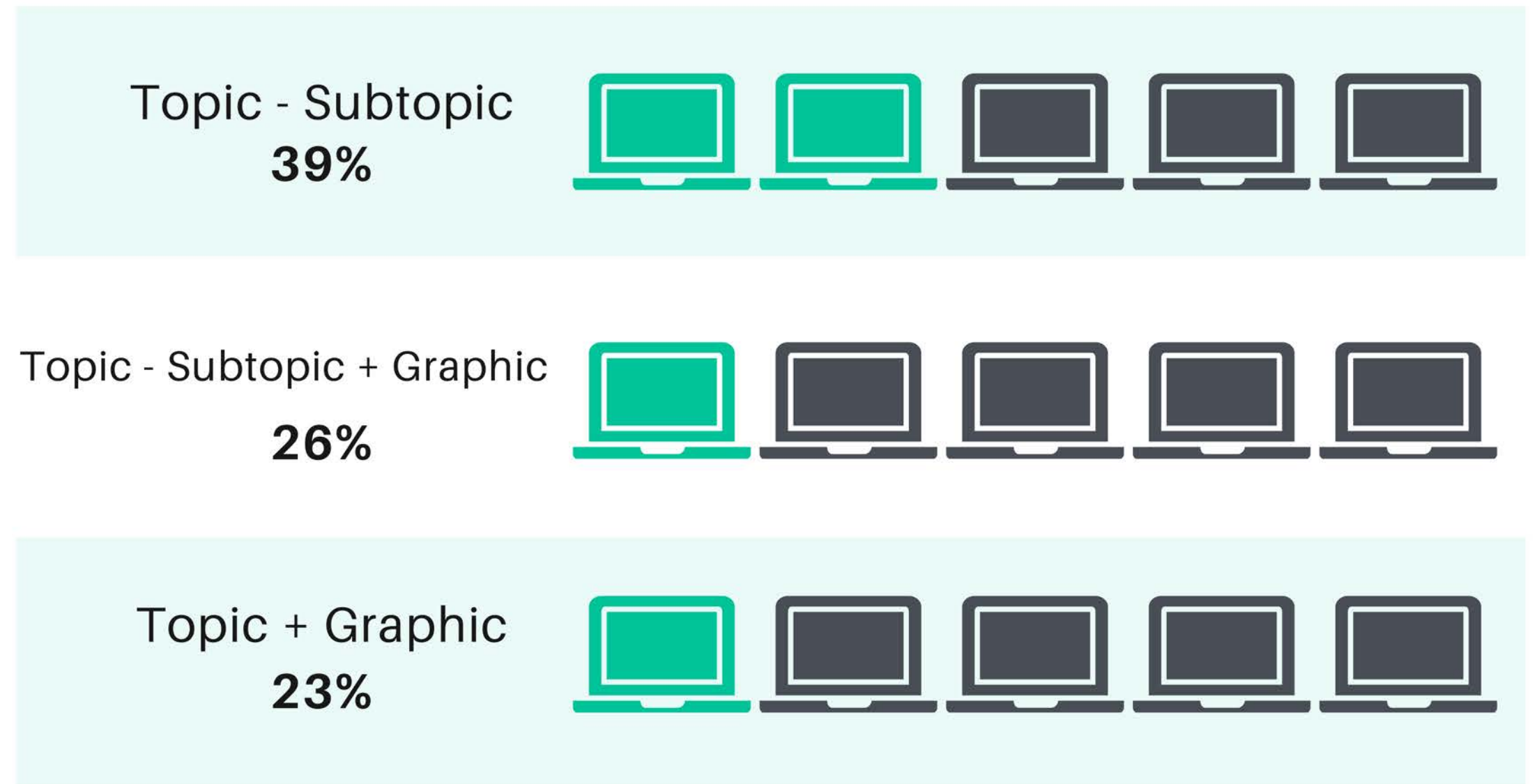
Chen, Wu and Borojevich are modeling of thermal and electrical behavior using several commercial softwares (I-DEAS, Maxwell, Flotherm and Saber) and 3-D, transient approaches.

- PRIMARY CONCERNS -**
- FIELD JOINT - HIGHEST CONCERN**
- **EROSION PENETRATION OF PRIMARY SEAL REQUIRES RELIABLE SECONDARY SEAL FOR PRESSURE INTEGRITY**
    - **IGNITION TRANSIENT - (0-600 MS)**
      - (0-170 MS) HIGH PROBABILITY OF RELIABLE SECONDARY SEAL
      - (170-330 MS) REDUCED PROBABILITY OF RELIABLE SECONDARY SEAL
      - (330-600 MS) HIGH PROBABILITY OF NO SECONDARY SEAL CAPABILITY
  - **STEADY STATE - (600 MS - 2 MINUTES)**
    - **IF EROSION PENETRATES PRIMARY O-RING SEAL - HIGH PROBABILITY OF NO SECONDARY SEAL CAPABILITY**
      - **BENCH TESTING SHOWED O-RING NOT CAPABLE OF MAINTAINING CONTACT WITH METAL PARTS GAP OPERATING TO MEOP**
      - **BENCH TESTING SHOWED CAPABILITY TO MAINTAIN O-RING CONTACT DURING INITIAL PHASE (0 - 170 MS) OF TRANSIENT**



**Academics and professionals create PowerPoint presentations that are heavily influenced by the standard template (Garner et al., 2009).**

Composite of slides representing common practices in technical communication (Garner et al., 2009)

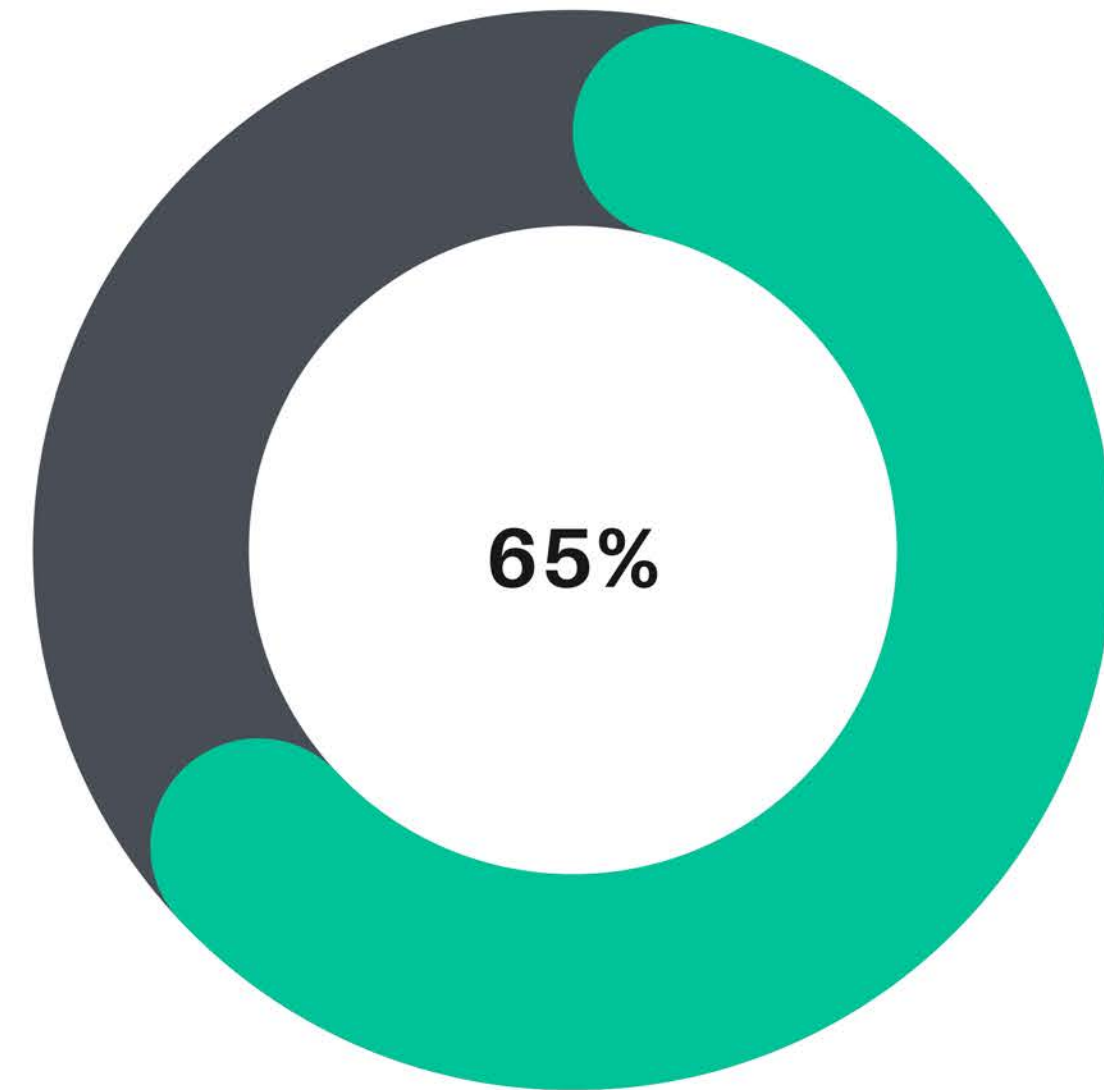




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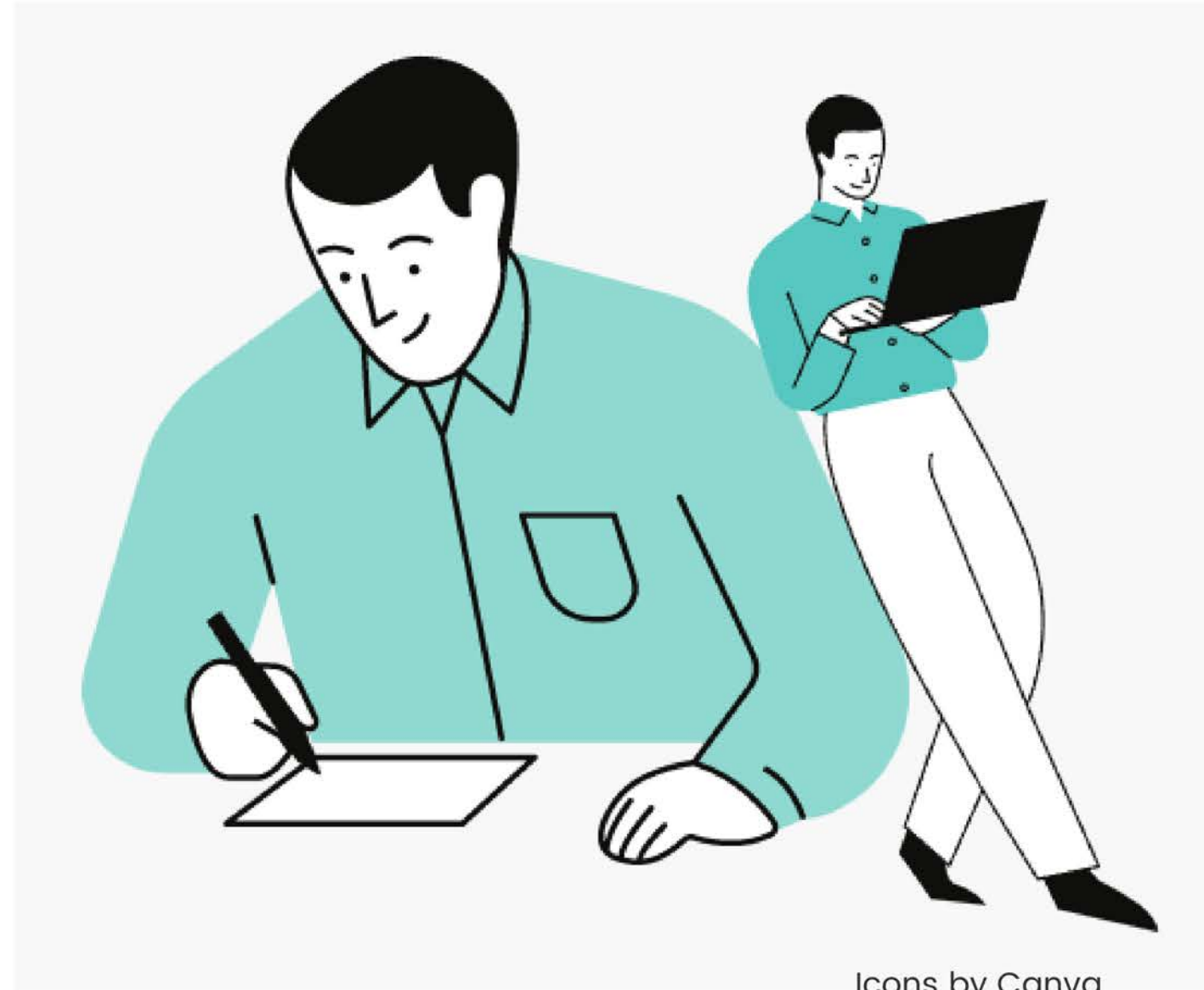


65% of slides conformed to topic-subtopic structure of PowerPoint default template (Garner et al., 2009)



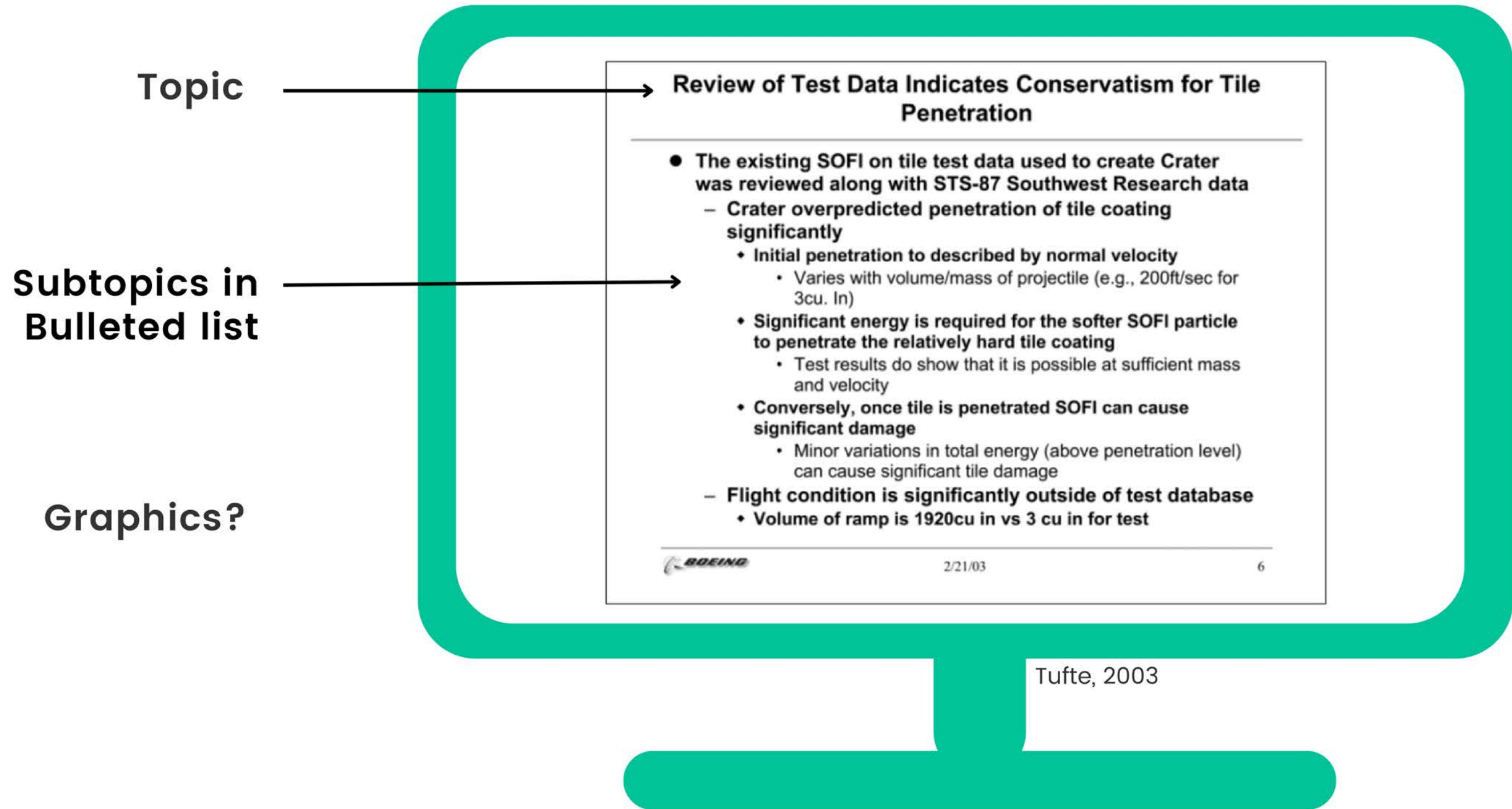
**Two factors contribute to a meaningful learning experience: purposeful explanation and inspiration for knowledge application.**

To teach students effectively about anatomy we must understand our audience and how they learn.



Icons by Canva

PowerPoints were not made for academia- and it shows (Tufte, 2003).

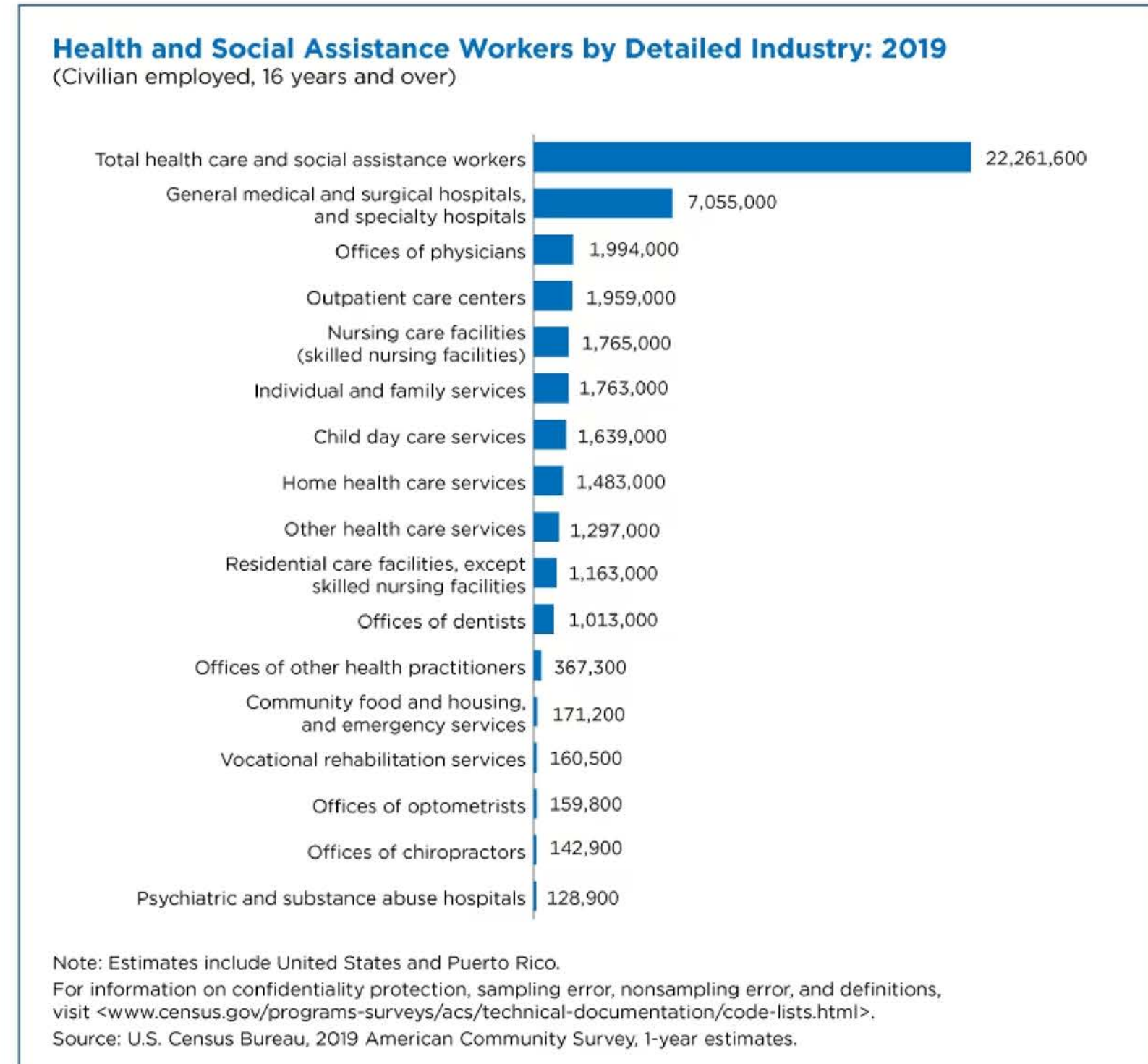




### III Literature Review

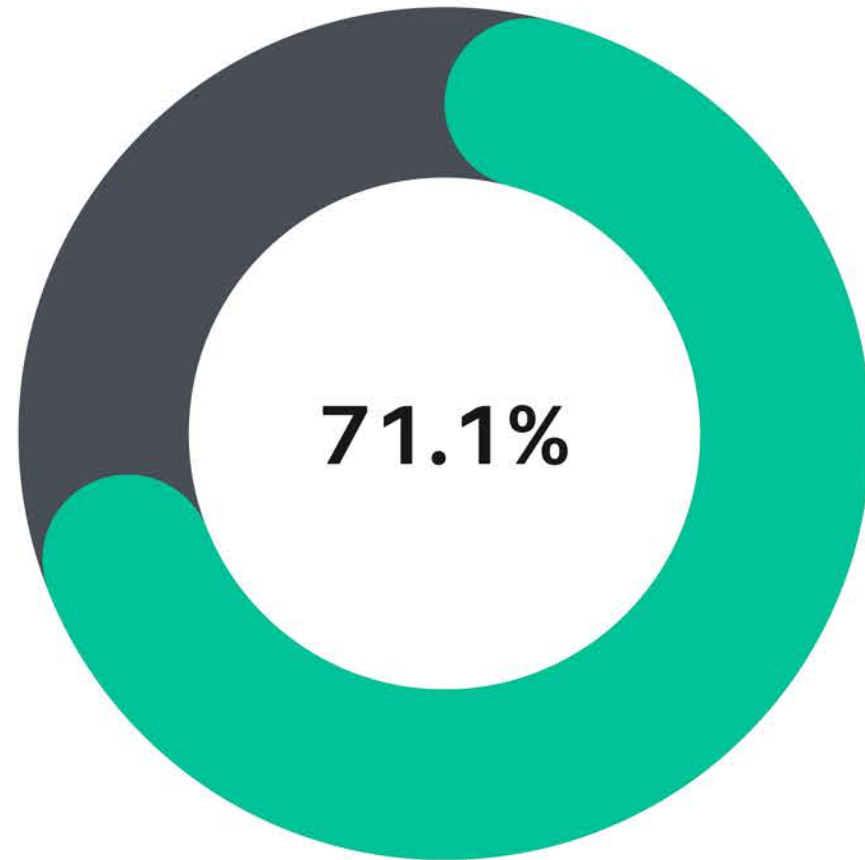
**PowerPoints are even more important a Post-COVID world because there are more students going into healthcare each year.**

Hybrid and digital courses meet the growing demand for health science courses like anatomy and physiology (Pollack, 2022, p.453).

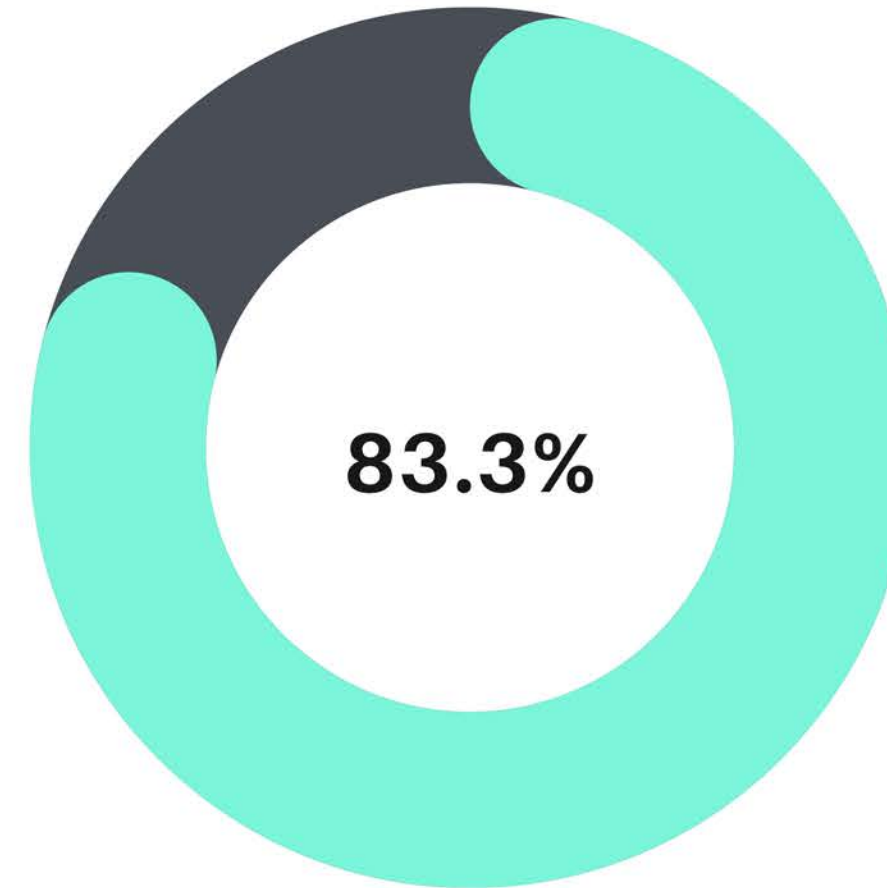


### III Literature Review

## Students like learning from PowerPoints (Pop et al., 2018).



71.1% of students in the study preferred PowerPoint style lectures



83.3% felt that PowerPoints helped them understand and study the material better than whiteboard presentations

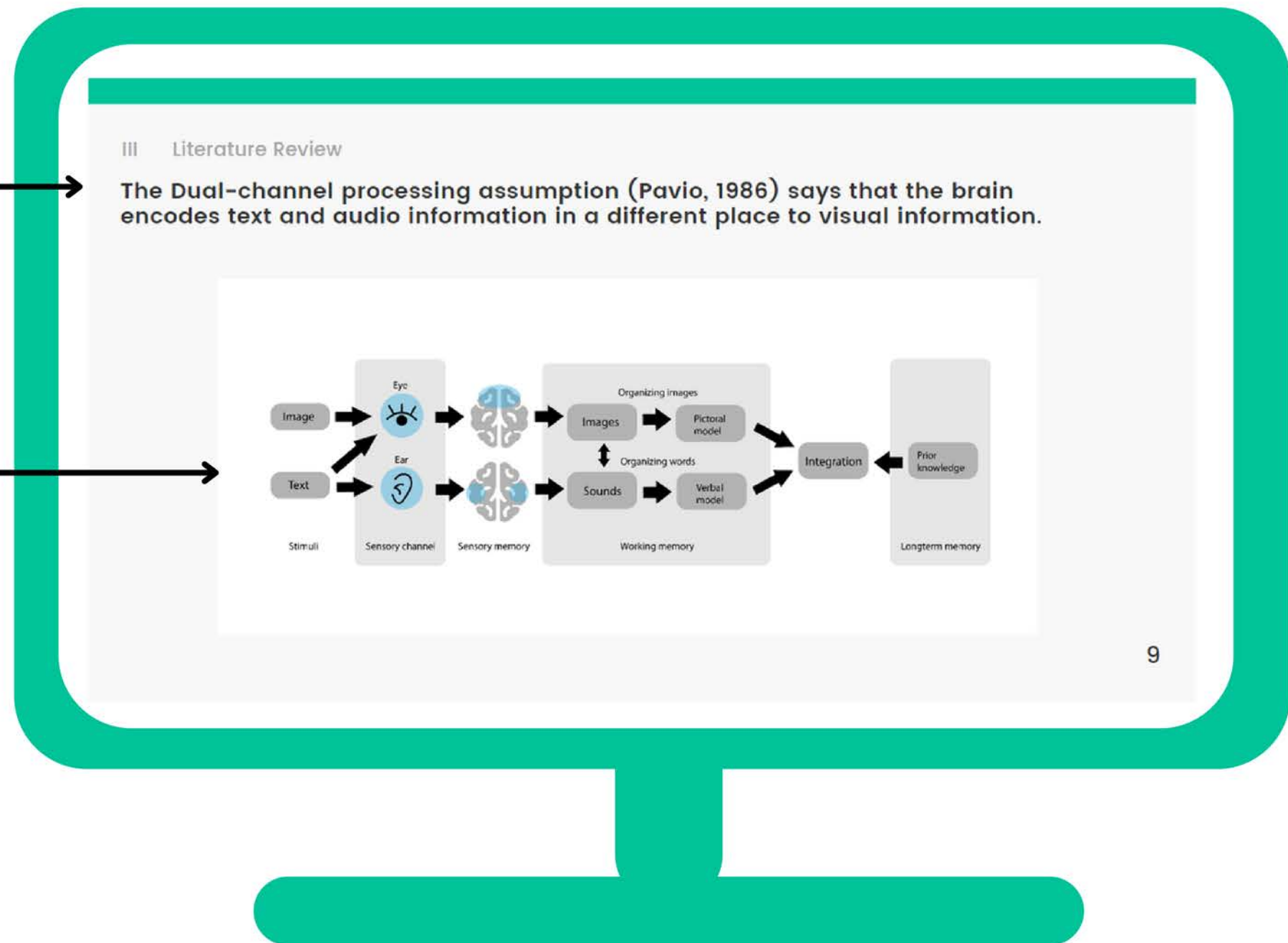
### III Literature Review

The Assertion-Evidence (AE) template was designed to make communication "efficient, memorable and persuasive" (Alley & Neeley, 2005, p.417).

**Assertion**

**Visual Evidence**

**Purposeful speech**

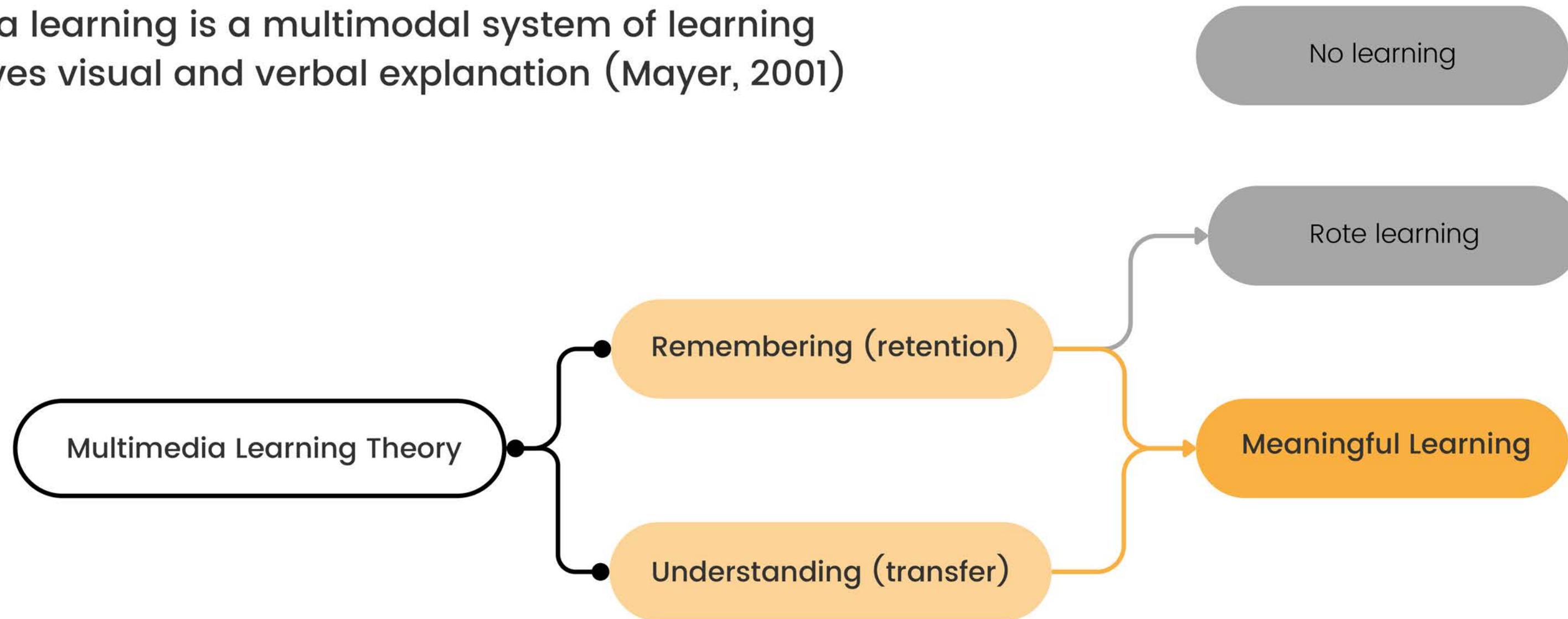




### III Literature Review

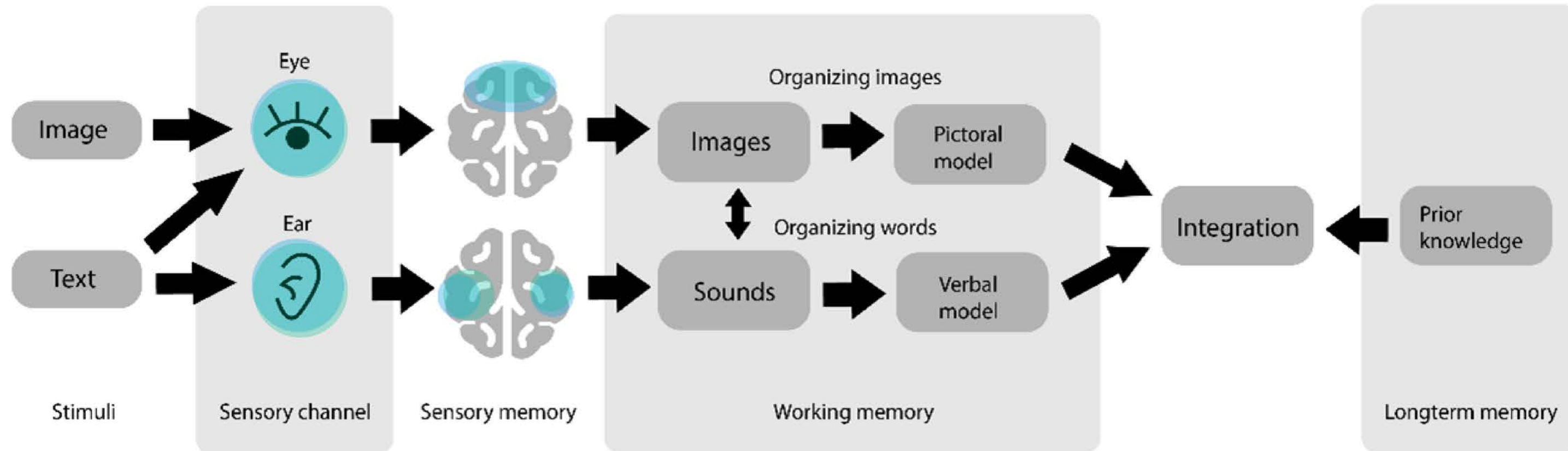
**The operational definition of meaningful learning is the combination of high retention and high transfer scores.**

Multimedia learning is a multimodal system of learning that involves visual and verbal explanation (Mayer, 2001)



### III Literature Review

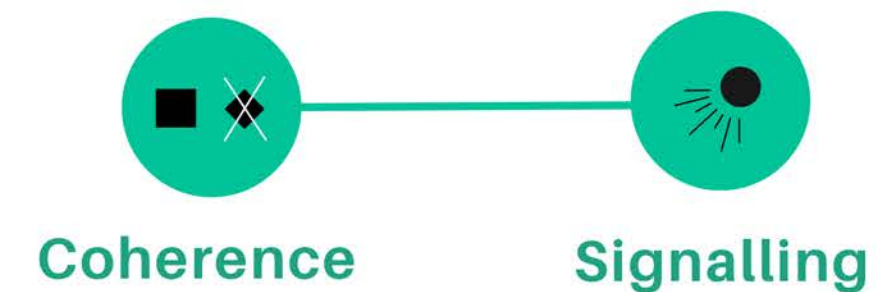
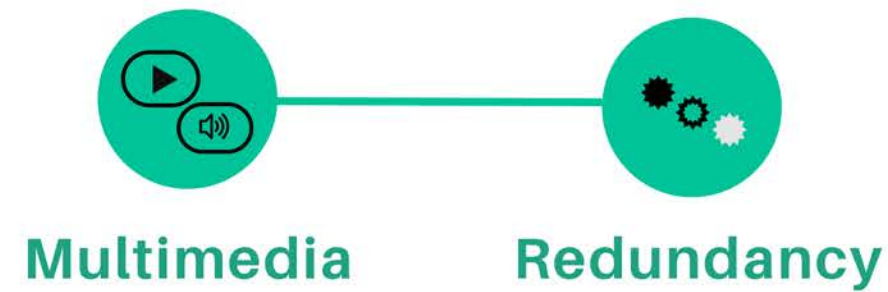
The Dual-channel processing assumption (Pavio, 1986) says that the brain encodes text and audio information in a different place to visual information.



Adapted from Multimedia Learning (p.59), by R. E. Mayer, 2001, Cambridge University Press. Copyright 2001 by Cambridge University Press. Adapted with Permission.

### III Literature Review

According to Mayer (2005), learning from multimedia presentations- including PowerPoint presentations- is most successful when certain principles are upheld.



III Literature Review

The Dual-channel processing assumption (Pavio, 1986) says that the brain encodes text and audio information in a different place to visual information.

The flowchart illustrates the dual-channel processing model. It starts with "Stimuli" (Image and Text) entering "Sensory channels" (Eye and Ear). From there, information goes to "Sensory memory" (represented by brain icons). The visual path goes through "Organizing images" to a "Pictorial model". The auditory path goes through "Organizing words" to a "Verbal model". Both models feed into "Integration", which is also influenced by "Prior knowledge". The final stage is "Longterm memory".

III Literature Review

The operational definition of meaningful learning is the combination of high retention and high transfer scores.

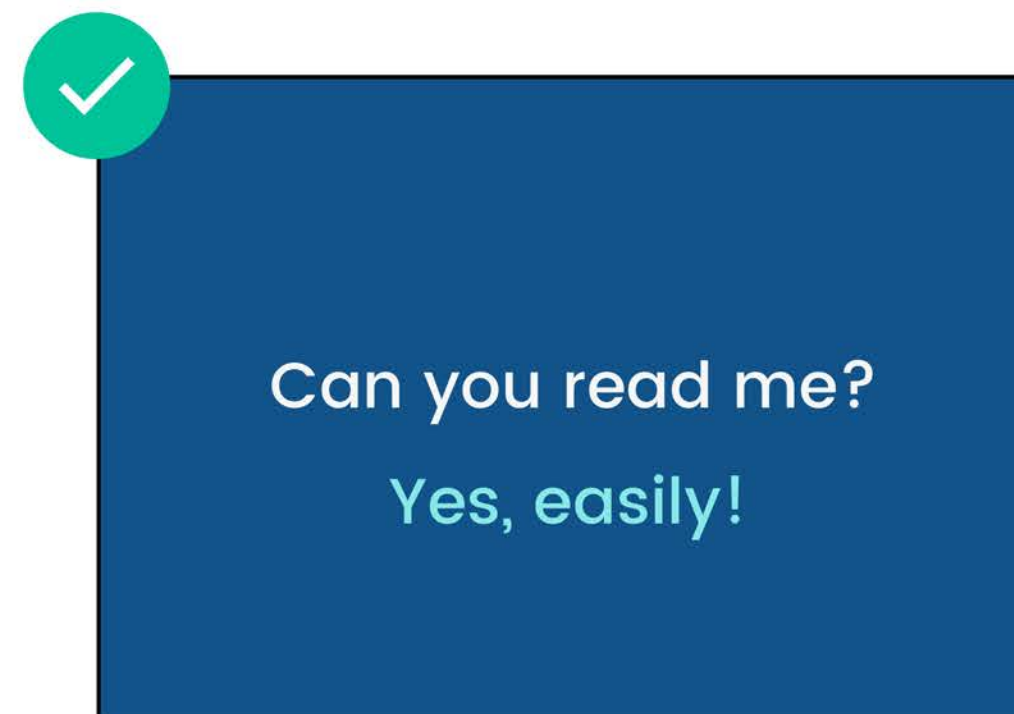
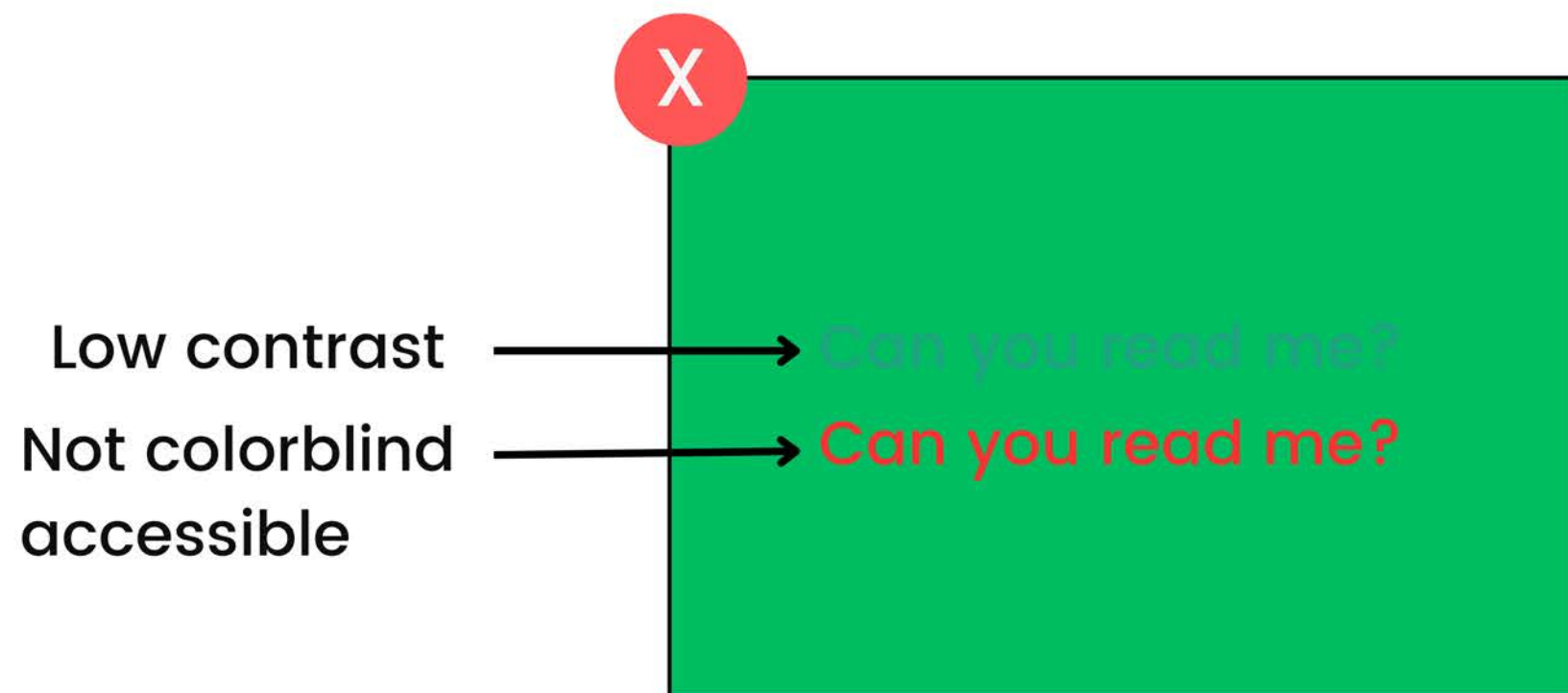
Multimedia learning is a multimodal system of learning that involves visual and verbal explanation (Mayer, 2001)

The flowchart shows "Multimedia Learning Theory" branching into "Remembering (retention)" and "Understanding (transfer)". "Remembering (retention)" leads to "No learning" and "Rote learning". "Understanding (transfer)" leads to "Meaningful Learning".



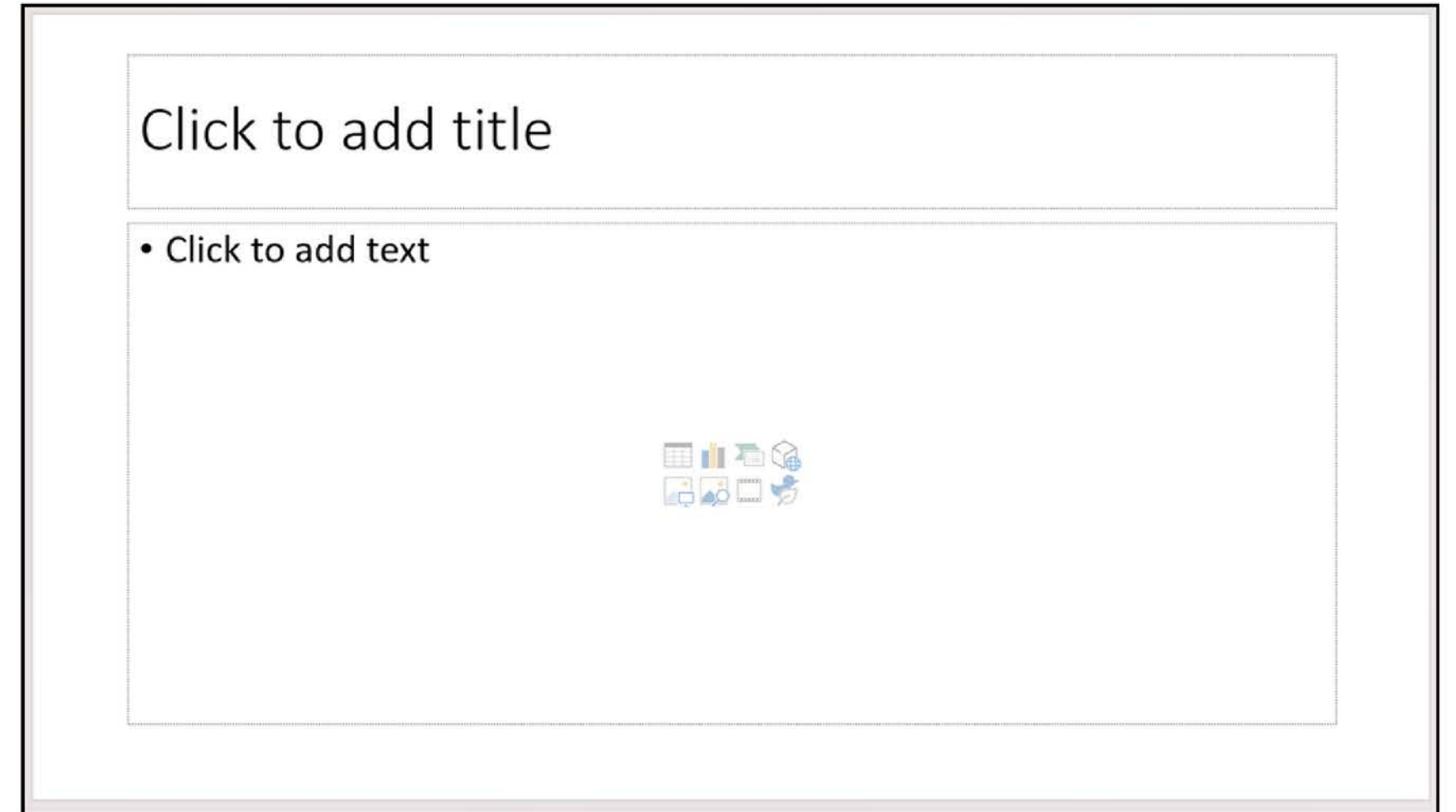
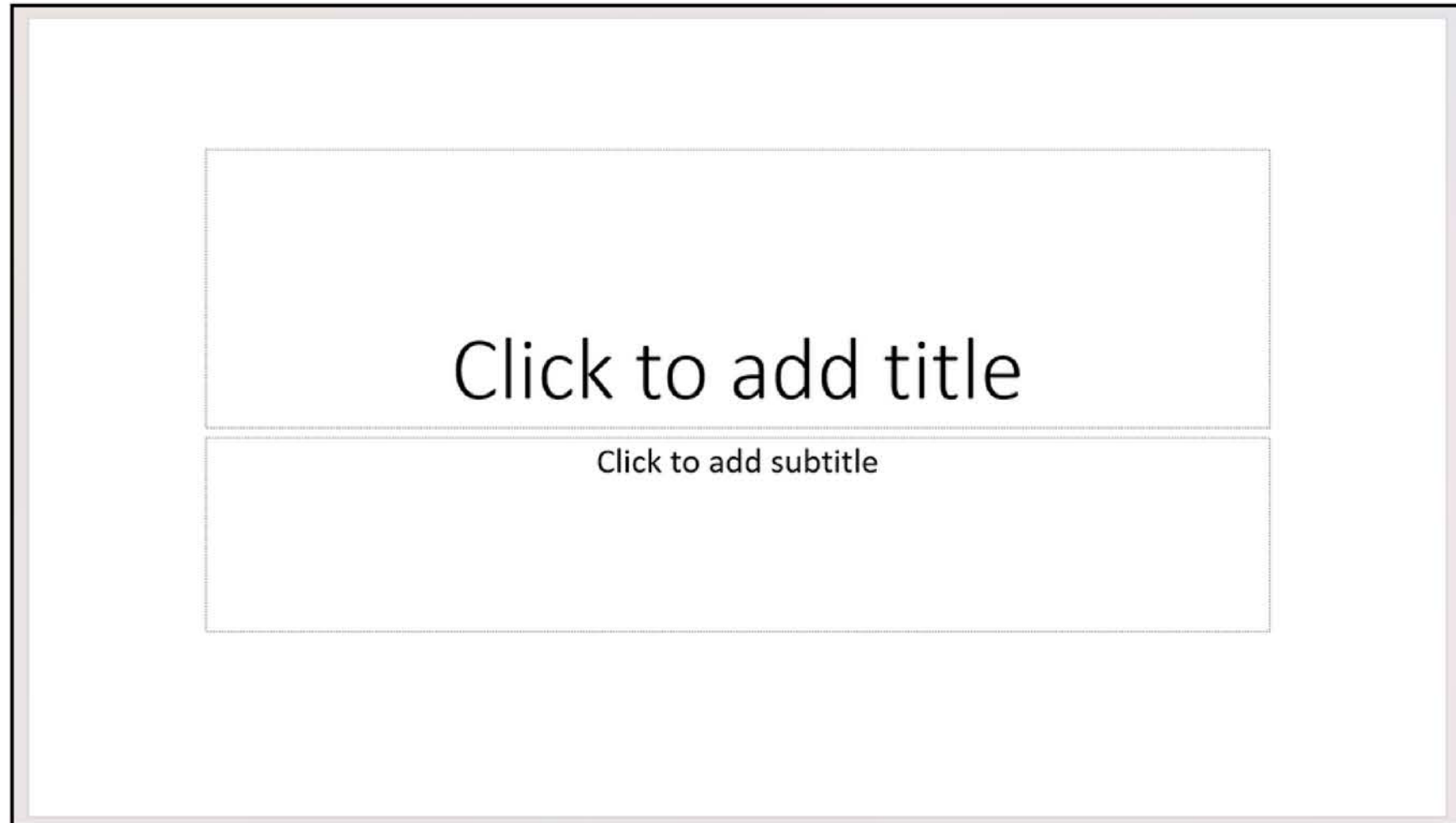
### III Literature Review

The purpose of an educational presentation is to teach; think about formatting that is accessible to the most amount of learners.



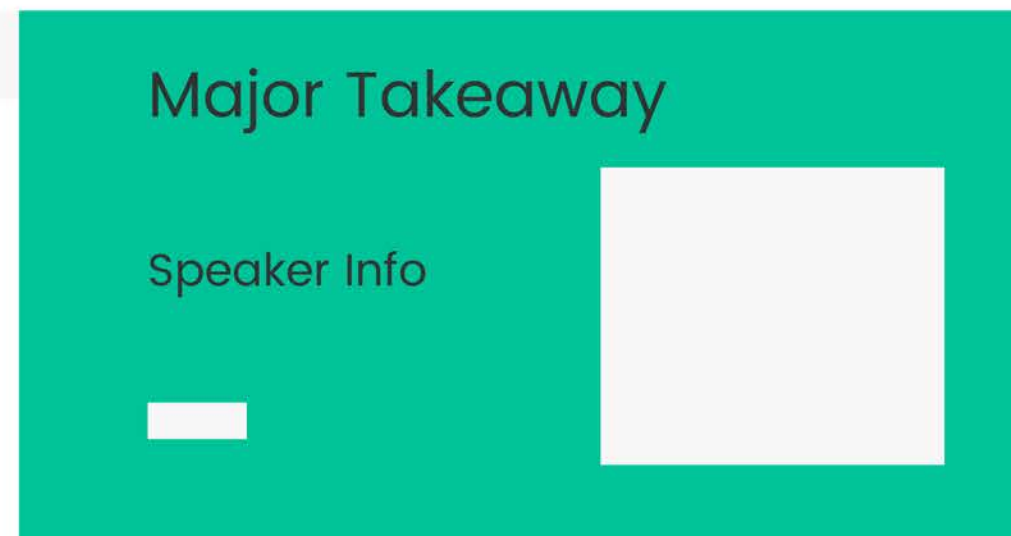
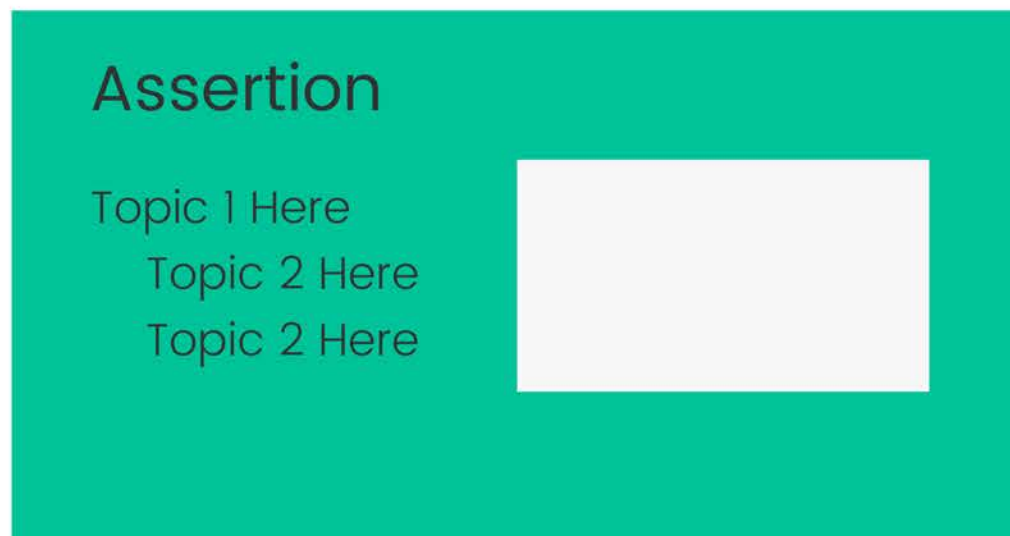
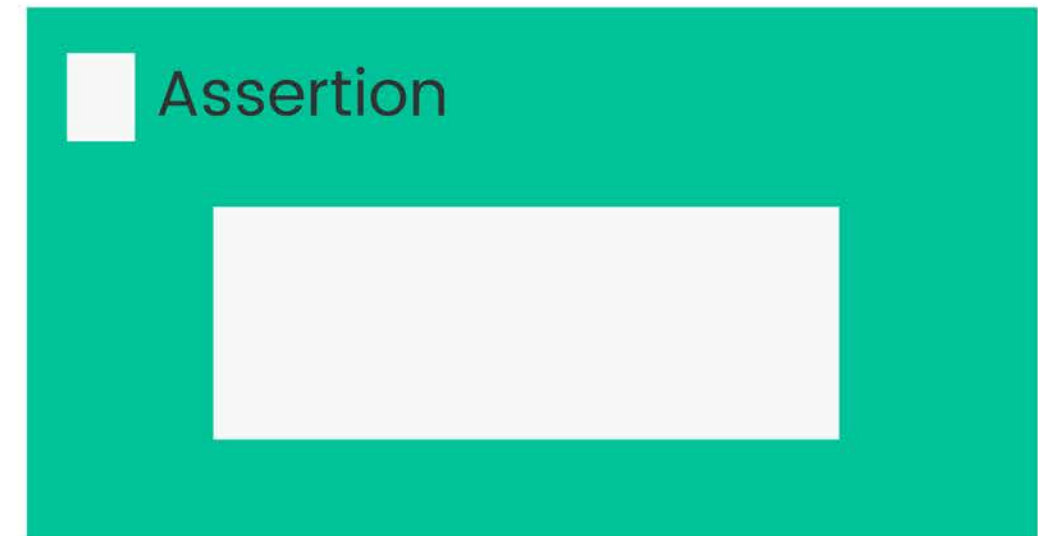
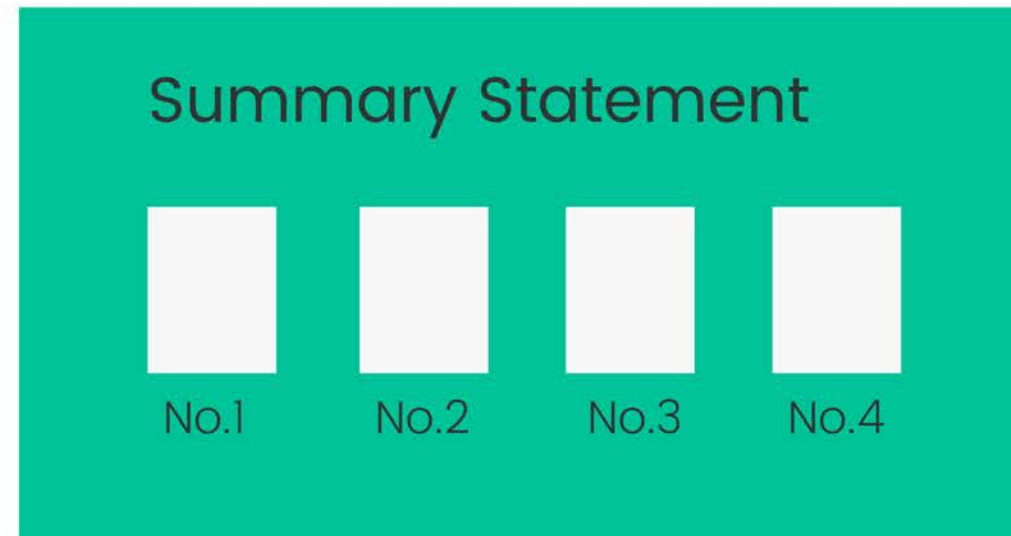
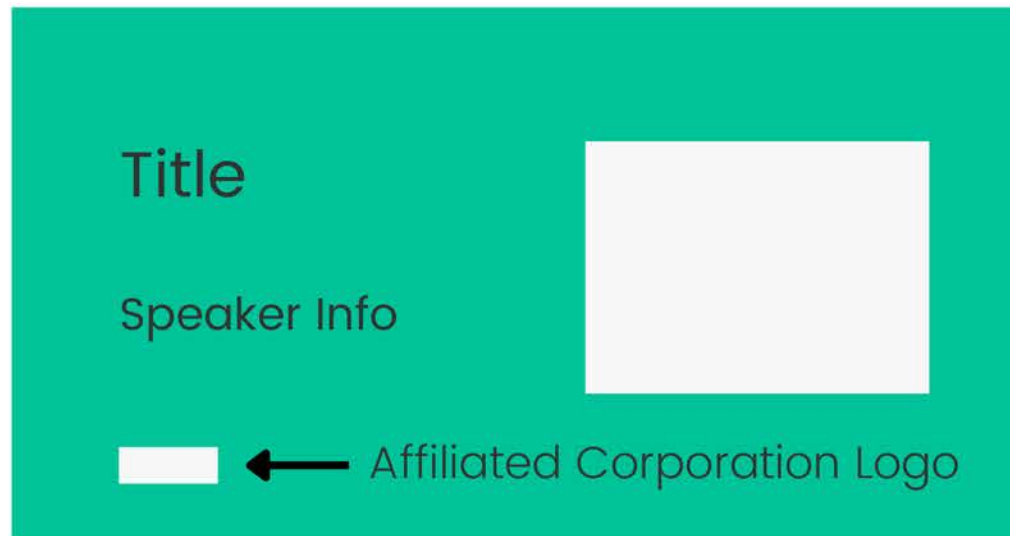
### III Literature Review

## A reminder of what PowerPoint looks like:



### III Literature Review

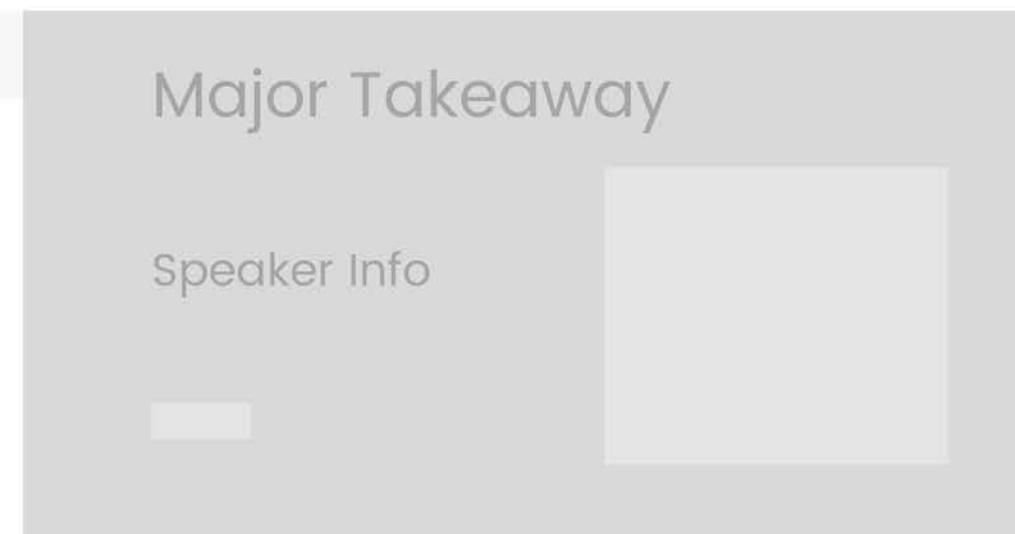
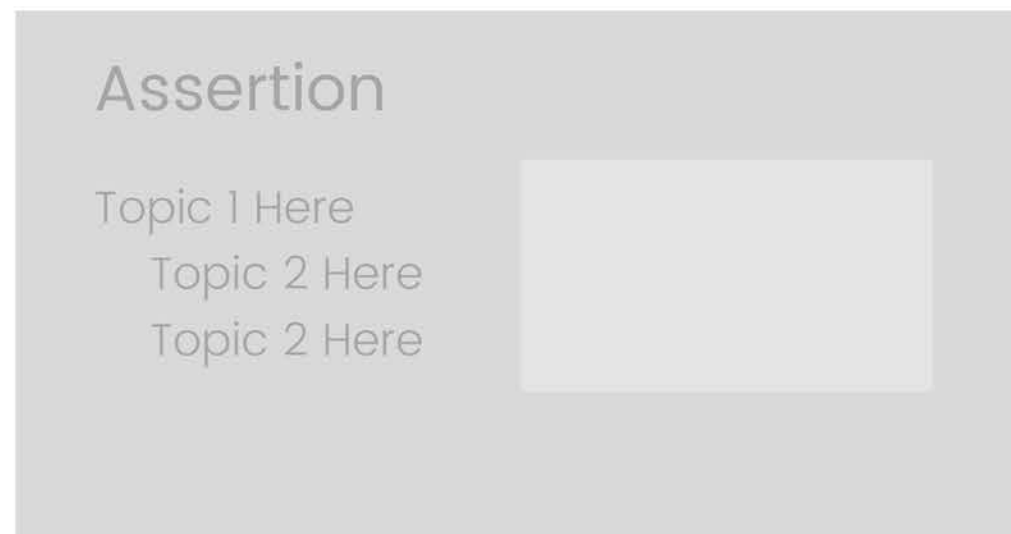
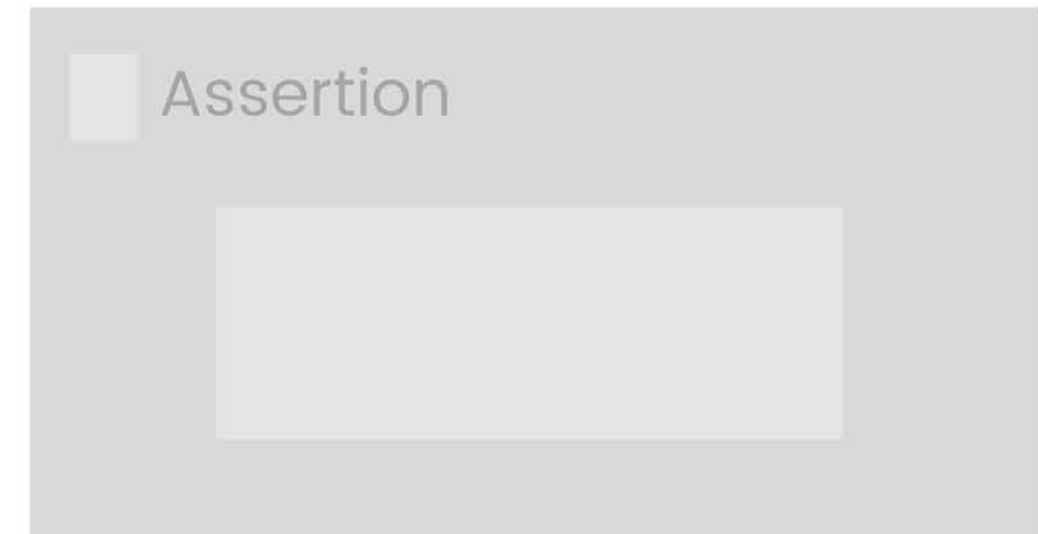
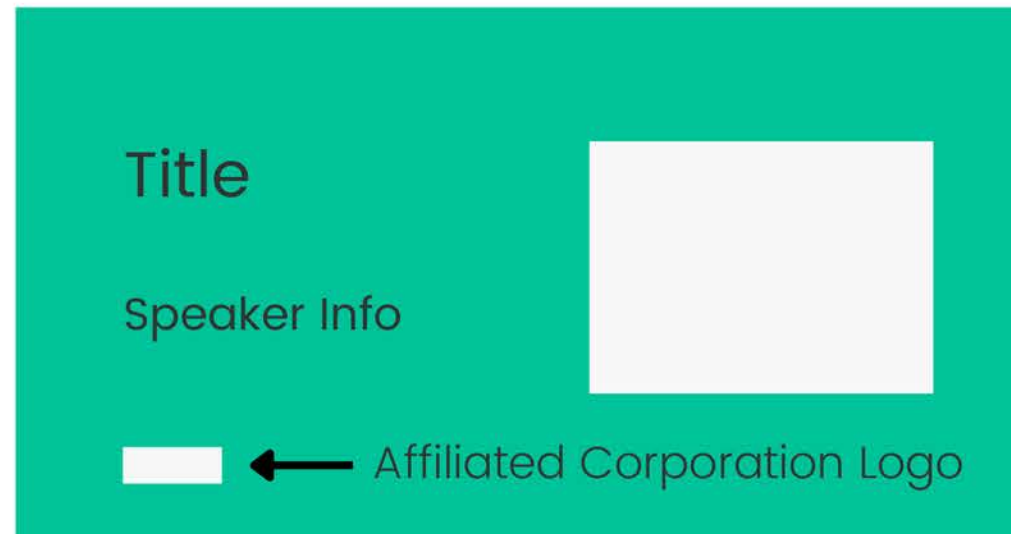
The AE approach includes a template for 5 slides types: title, mapping, transition, content and conclusion.





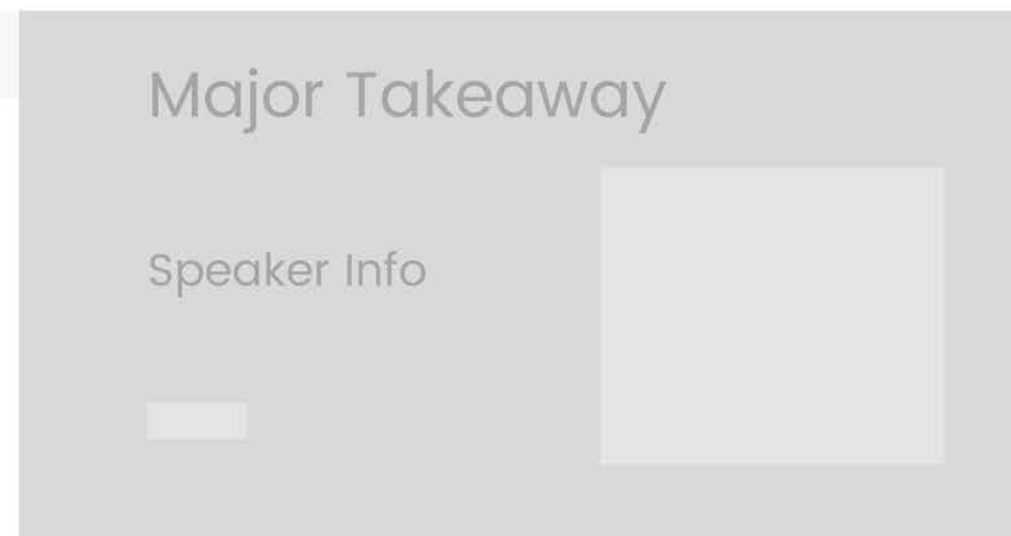
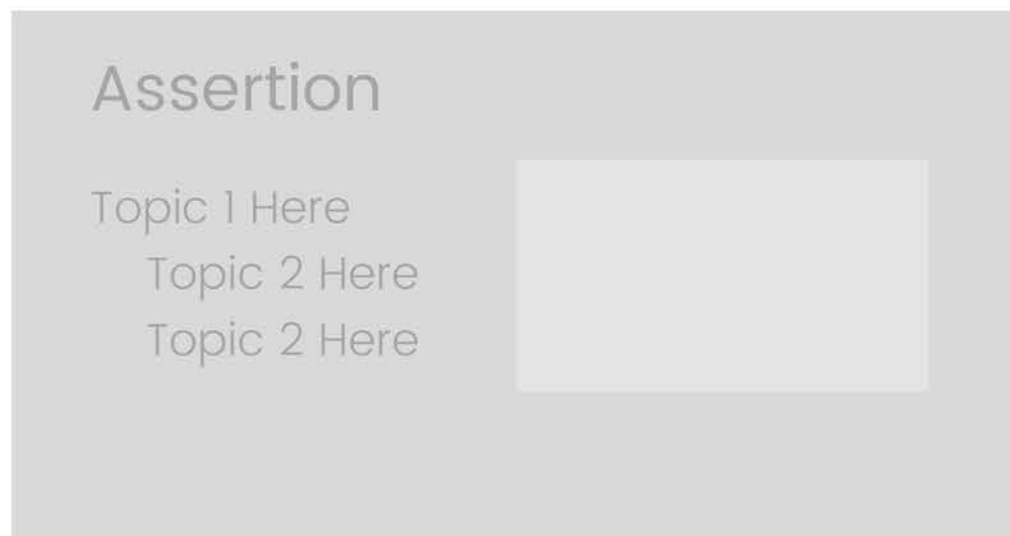
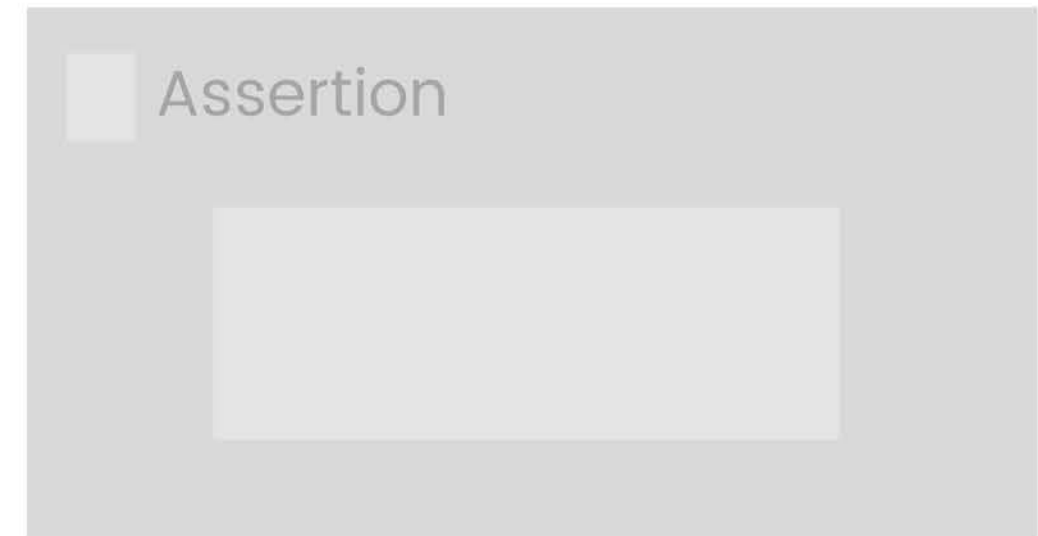
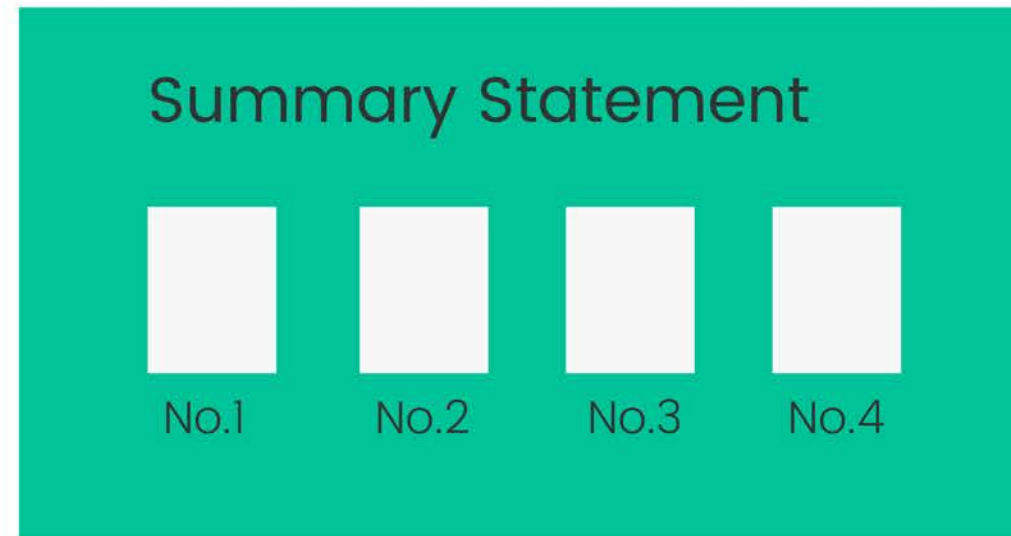
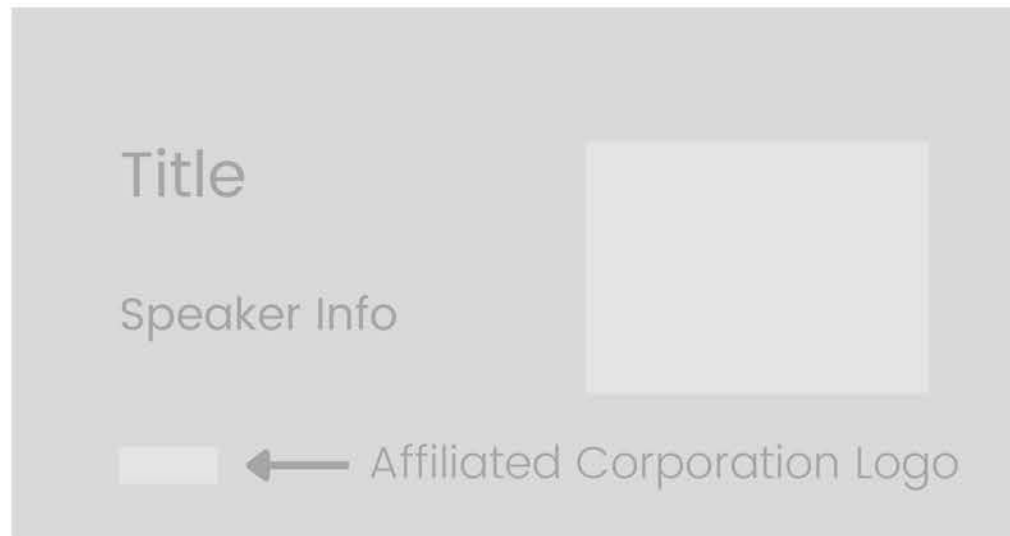
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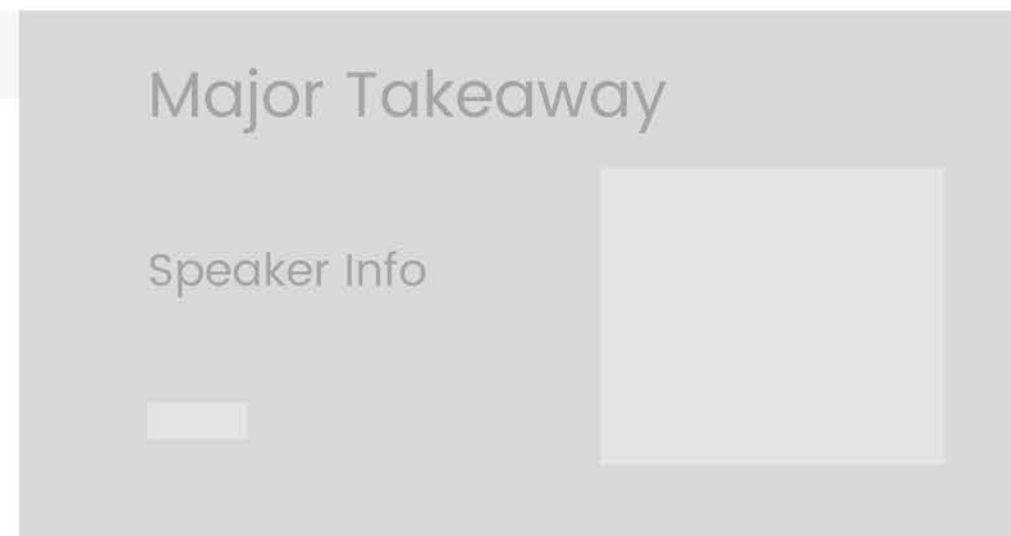
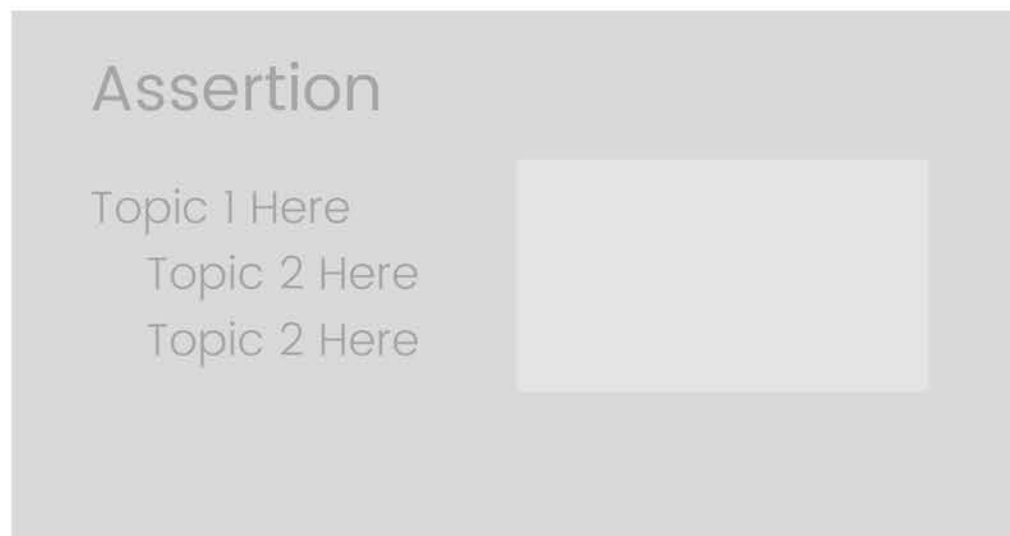
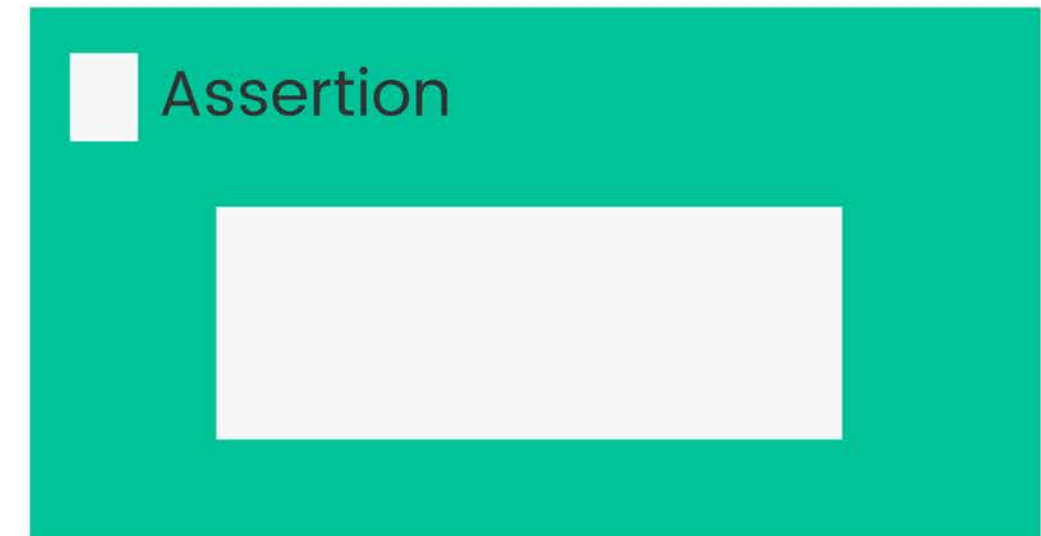
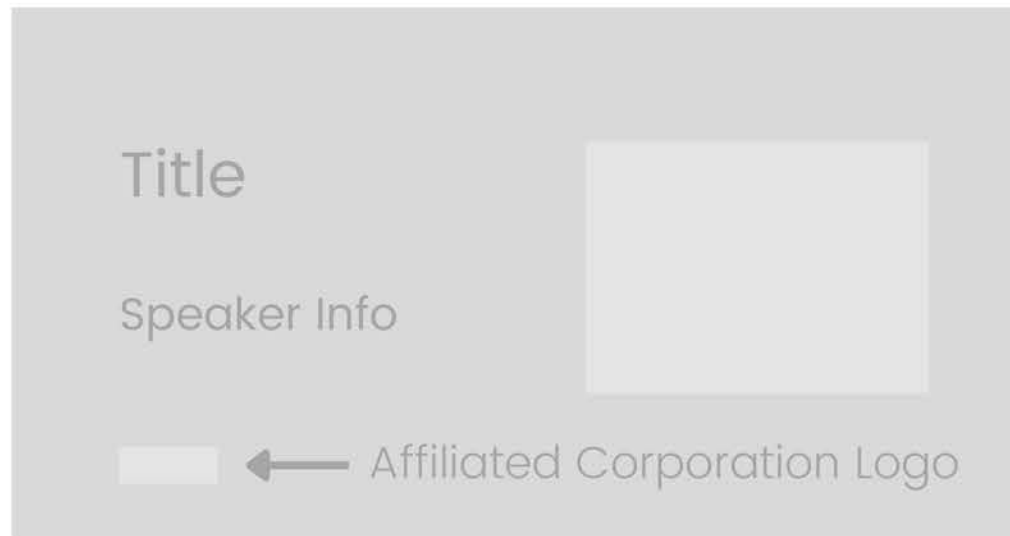
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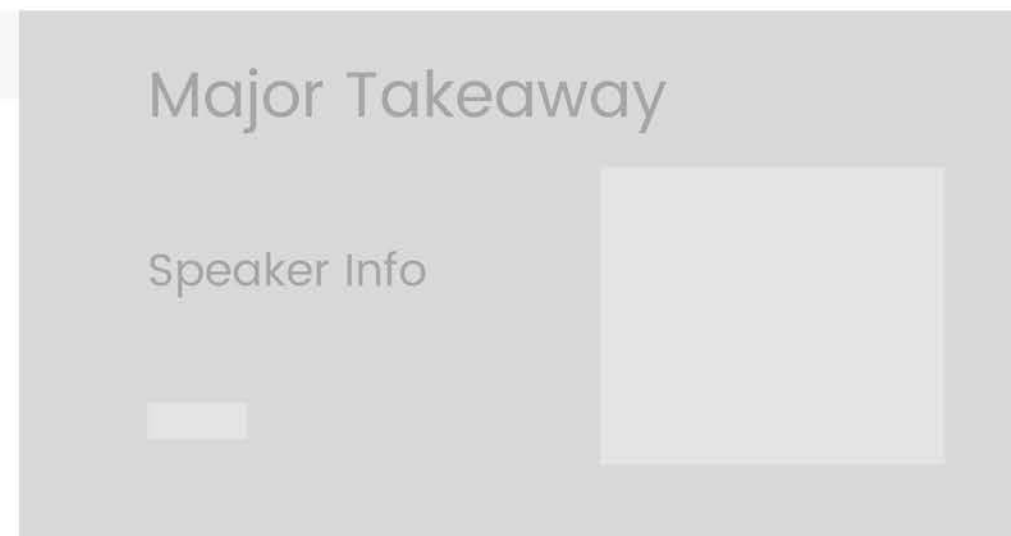
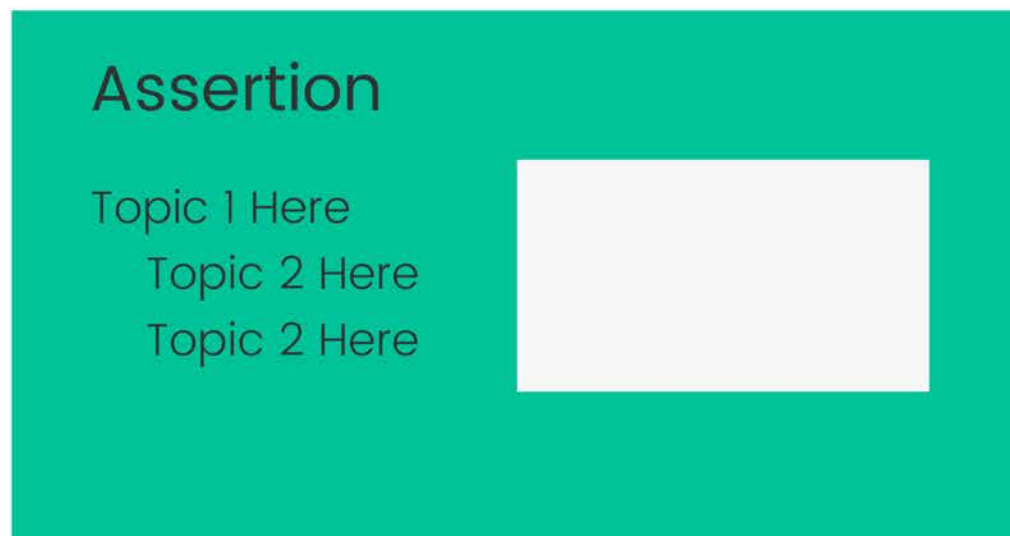
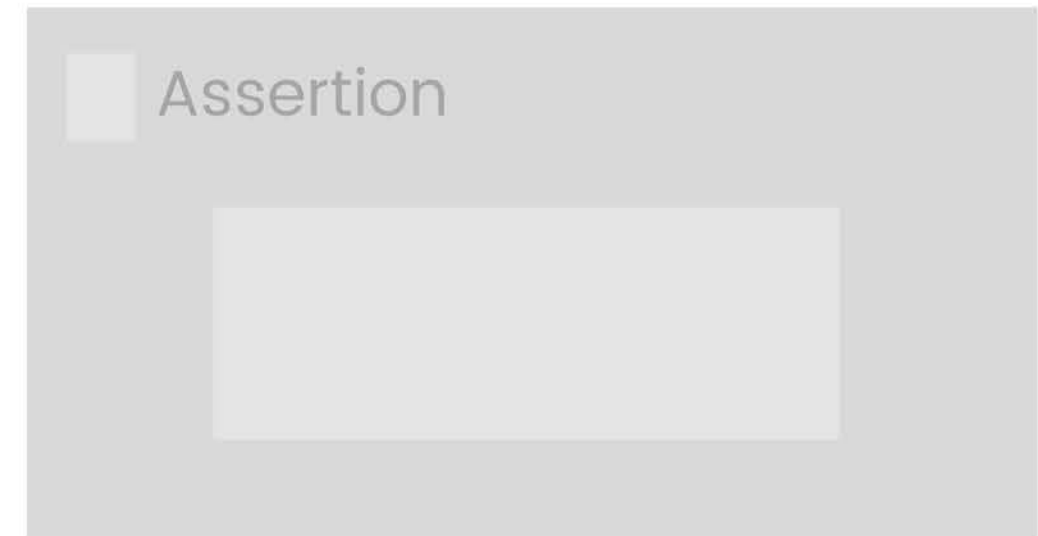
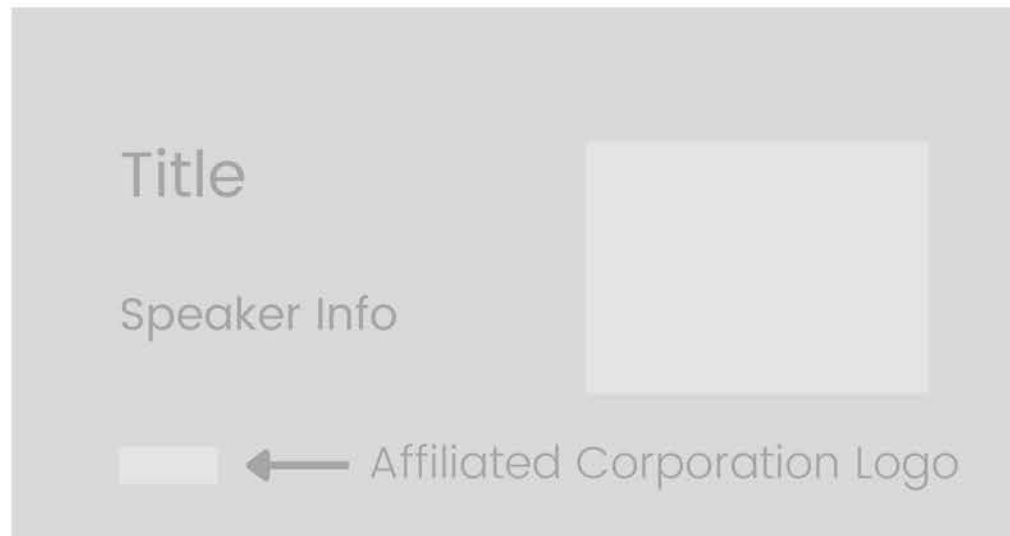
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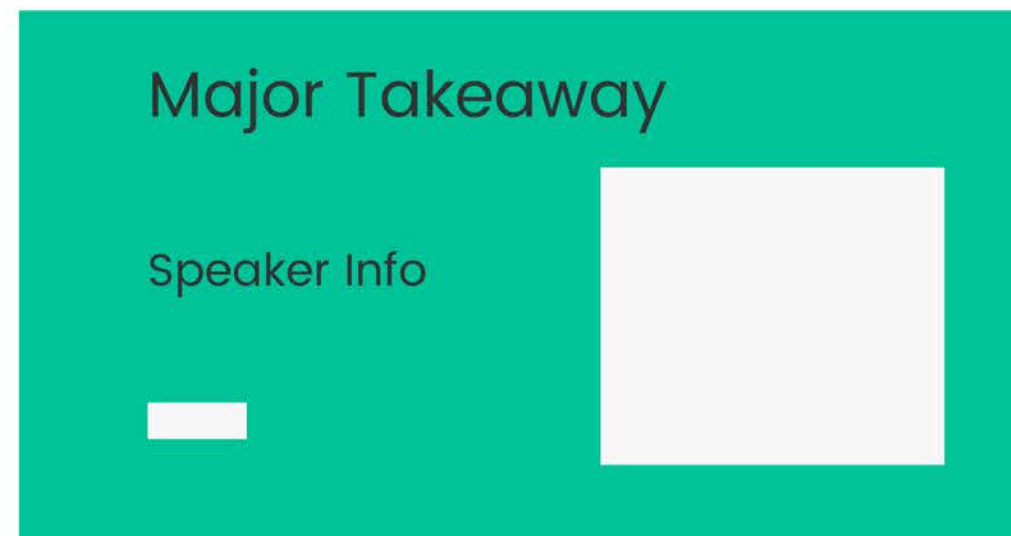
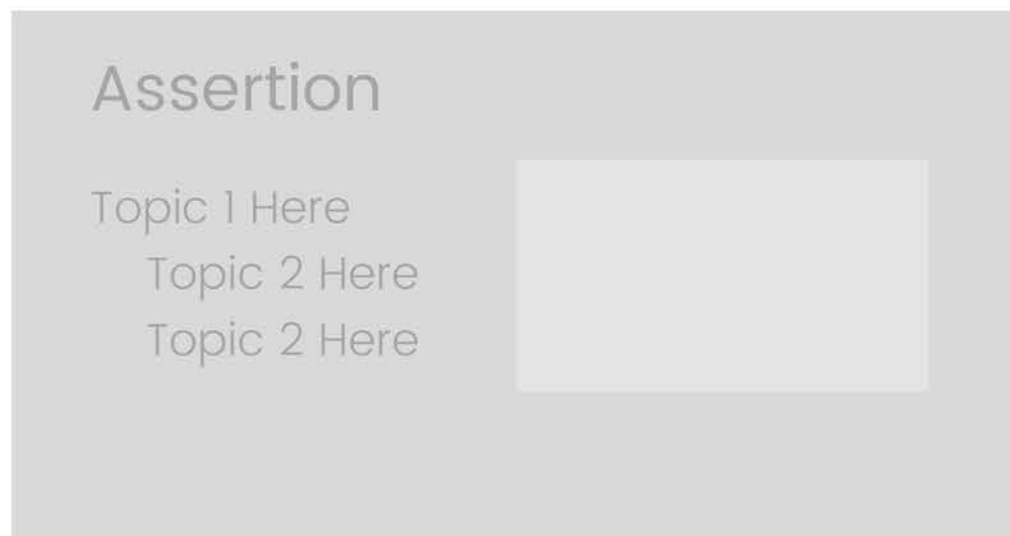
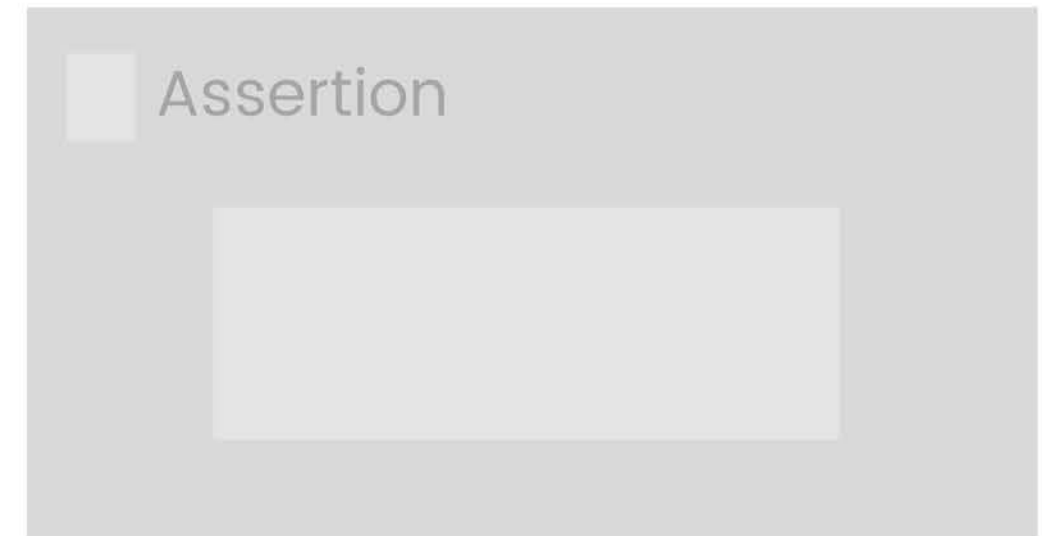
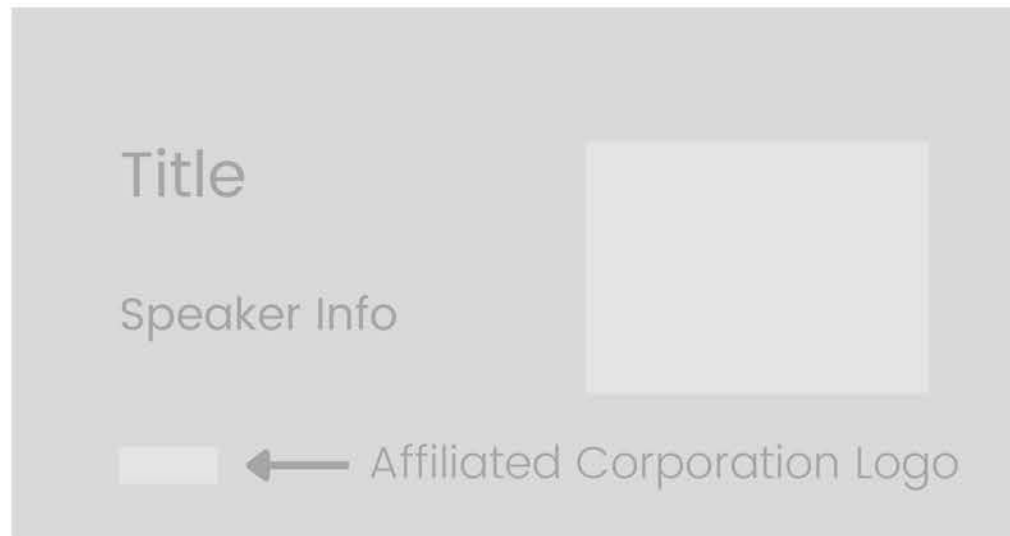
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### III Literature Review

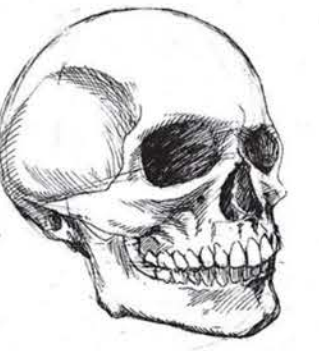
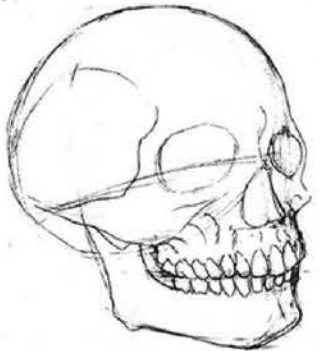
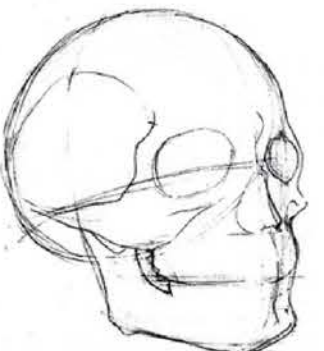
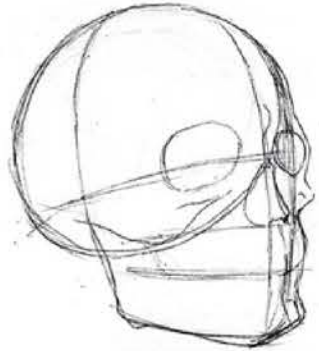
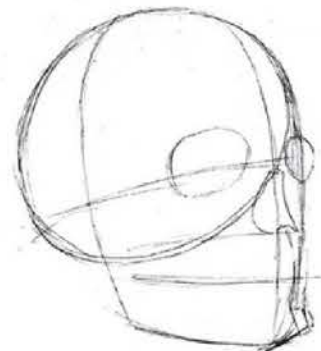
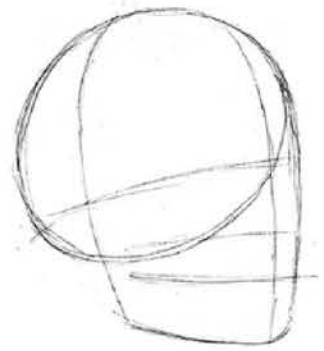
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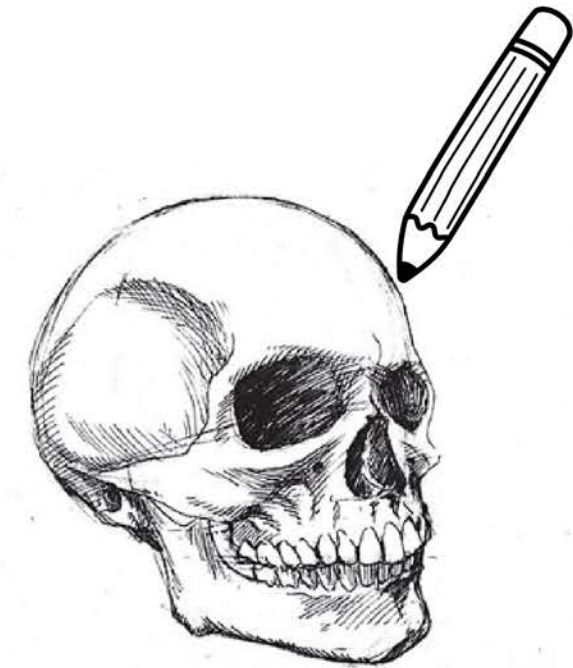
**Visuals need to be supportive and accessible.**

Topic: Drawing a skull



Ben House

Visual Evidence



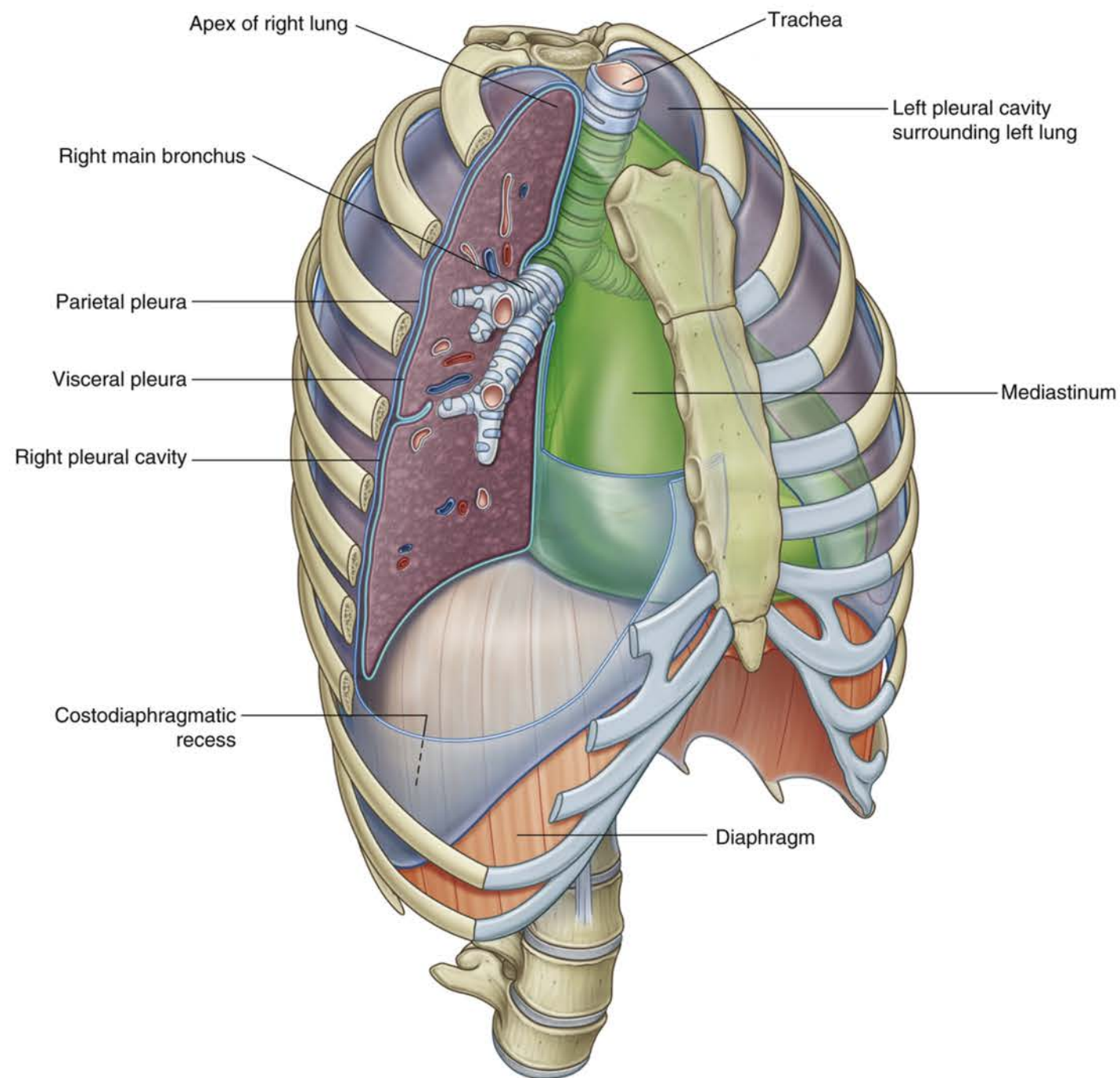
Ben House

Visual

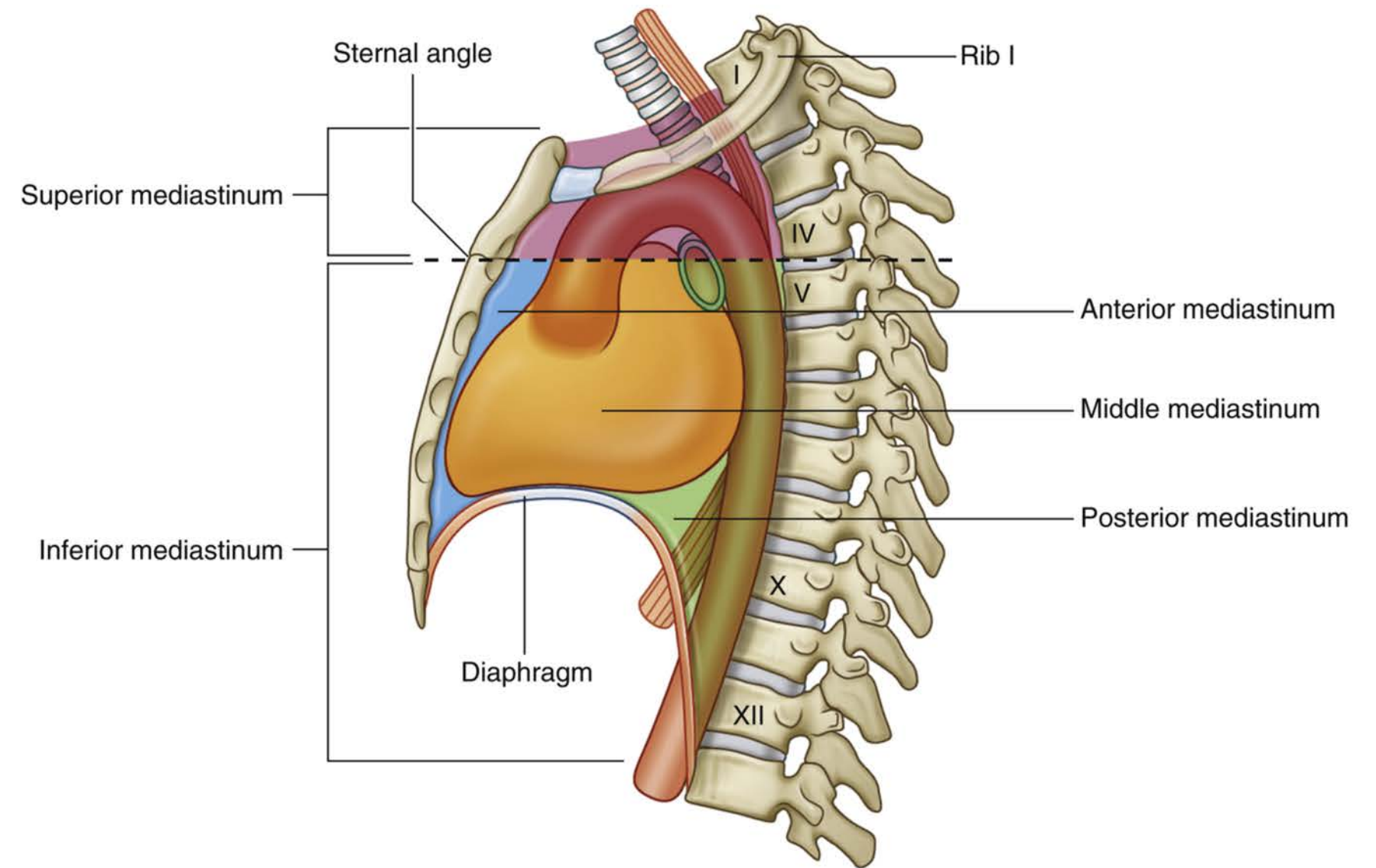


### III Literature Review

The deliverables of this research taught students about thoracic cavity anatomy.



Drake, Richard L., 2023



Drake, Richard L., 2023



## V Research Significance

This lack of understanding of learning psychology and graphic design alongside PowerPoint's design defaults lead to inconsistencies in the style of anatomy presentations and underused potential for meaningful learning in the classroom.

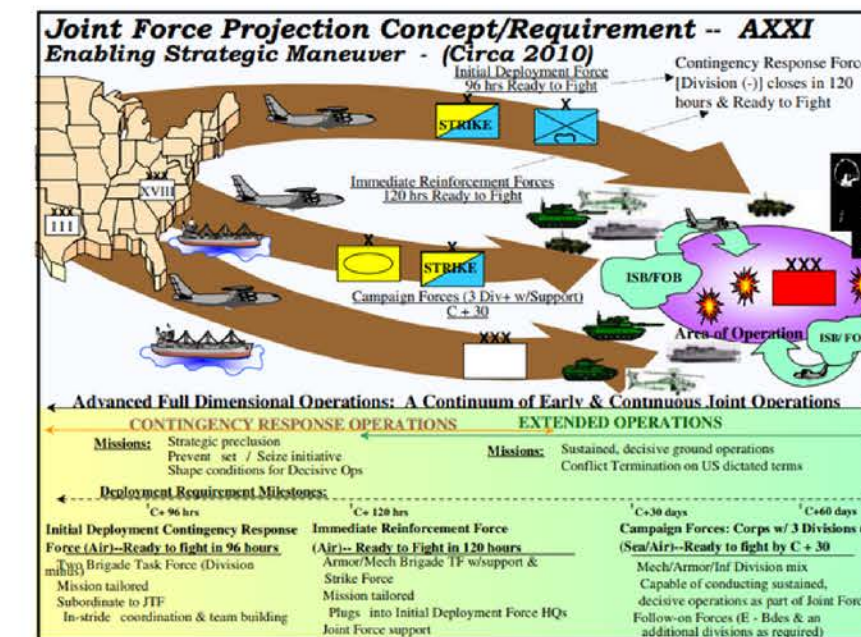
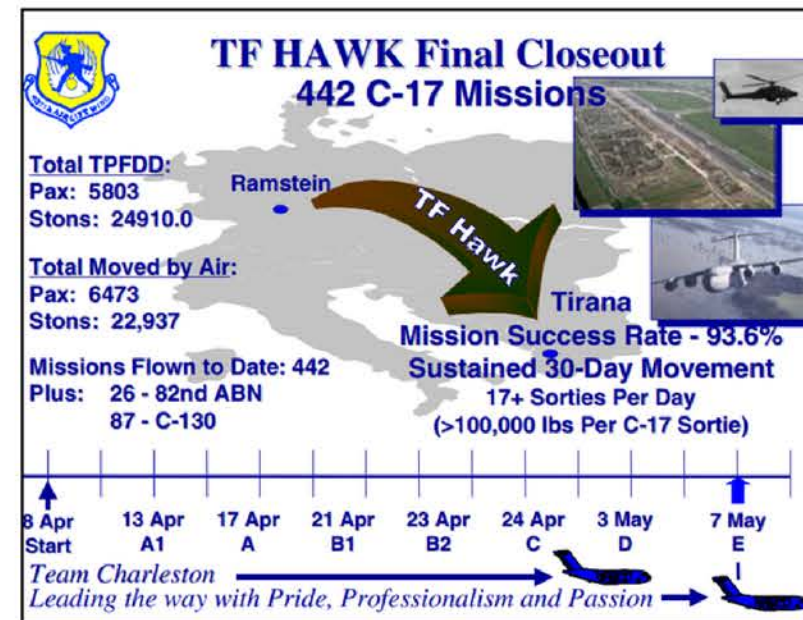
HISTORY OF O-RING DAMAGE ON SRM FIELD JOINTS

SRM No.	Cross Sectional View			Top View			Clocking Location (deg)
	Erosion Depth (in.)	Perimeter Affected (deg)	Nominal Dia. (in.)	Length Of Max Erosion (in.)	Total Heat Affected Length (in.)		
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61A LH CENTER FIELD**	None	NONE	0.280	NONE	NONE	330° - 18°	
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\*Hot gas path detected in putty. Indication of heat on O-ring, but no damage.  
 \*\*Soot behind primary O-ring.  
 \*\*\*Soot behind primary O-ring, heat affected secondary O-ring.  
 Clocking rotation of leak check port - 0 deg.

OTHER SRM-15 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY AND NO SOOT HEAR OR BEYOND THE PRIMARY O-RING

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Alley, 2003

 **V** **Research Question**

**Can the Assertion-Evidence Approach be used to create an educational PowerPoint presentation on thoracic cavity anatomy that improves meaningful learning in a graduate student audience?**



 V **Methods**

The researcher created two main deliverables: one standard PowerPoint video lecture and one Assertion-Evidence PowerPoint lecture.



Speak to Anatomy and Cell biology faculty about common anatomy topics



Pick topic and gather research



Write script and create survey questions



Pick visual evidence



Create standard PowerPoint and AE PowerPoint



Record video lectures



Test & record results

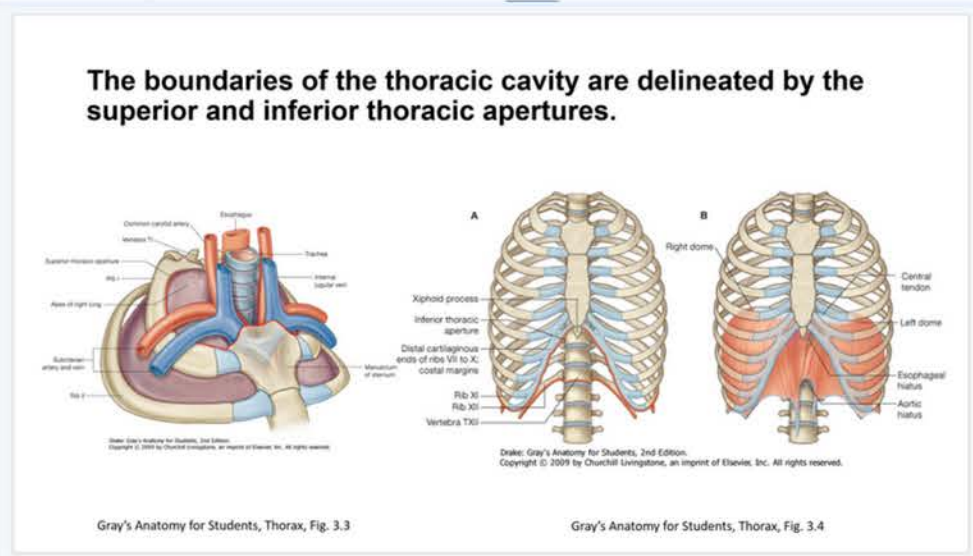
## V Methods

Both PowerPoint lectures used the same script for the major content slides and the same images.

Assertion: The boundaries of the thoracic cavity are delineated by the superior and inferior thoracic apertures.

### AE PowerPoint

**The boundaries of the thoracic cavity are delineated by the superior and inferior thoracic apertures.**



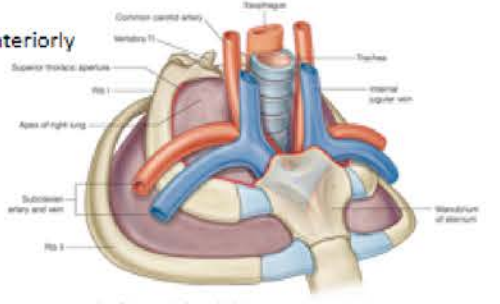
Gray's Anatomy for Students, Thorax, Fig. 3.3

Gray's Anatomy for Students, Thorax, Fig. 3.4

### Standard PowerPoint

**Superior Thoracic Aperture**

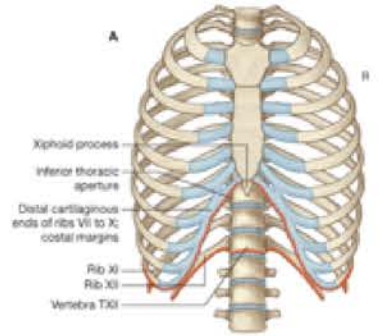
- Superior thoracic aperture (Thoracic inlet)
  - T1 body posteriorly
  - Superior border of manubrium anteriorly
  - First ribs laterally



Gray's Anatomy for Students, Thorax, Fig. 3.3

**Inferior Thoracic Aperture**

- Inferior thoracic aperture (thoracic outlet)
  - Thoracic outlet
  - T12 body posteriorly
  - Ribs XI and XII posterolaterally
  - Ribs VII – X and xiphoid process anteriorly
  - Closed by diaphragm (floor of thoracic cavity)
- Closed by diaphragm (floor of thoracic cavity)
  - Note that the thorax is not defined by the entire rib cage



Gray's Anatomy for Students, Thorax, Fig. 3.4

The survey collected both quantitative and qualitative data.

### Survey Part 1: Quantitative

Asked students about:

Recall thoracic anatomy

Clinical significance of certain anatomical structures in the thorax

### Survey Part 2: Qualitative

Asked students about:

their confidence in answering questions

If parts of the template oriented them to the purpose of the slide,

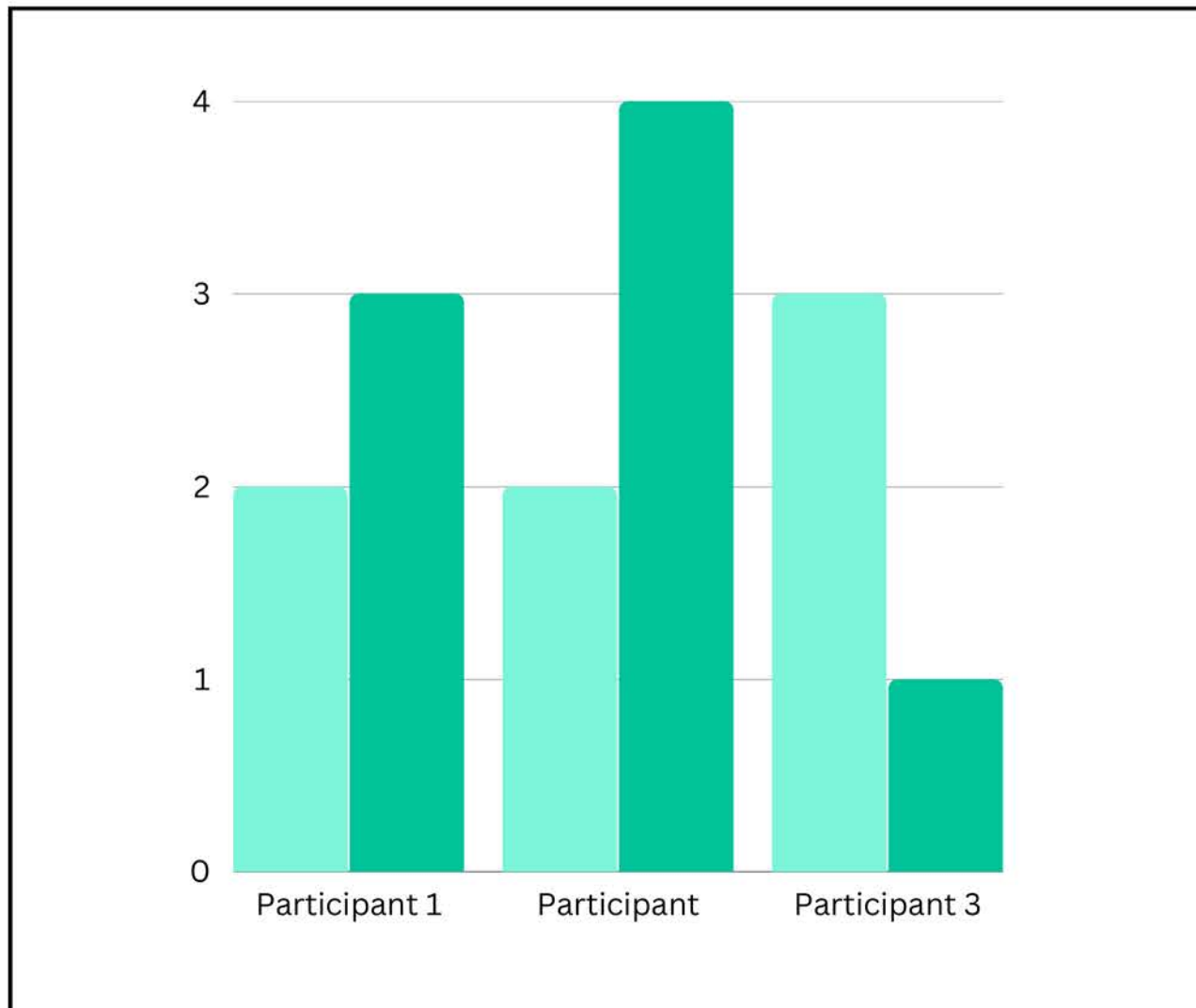
what they did or didn't like about the presentation.



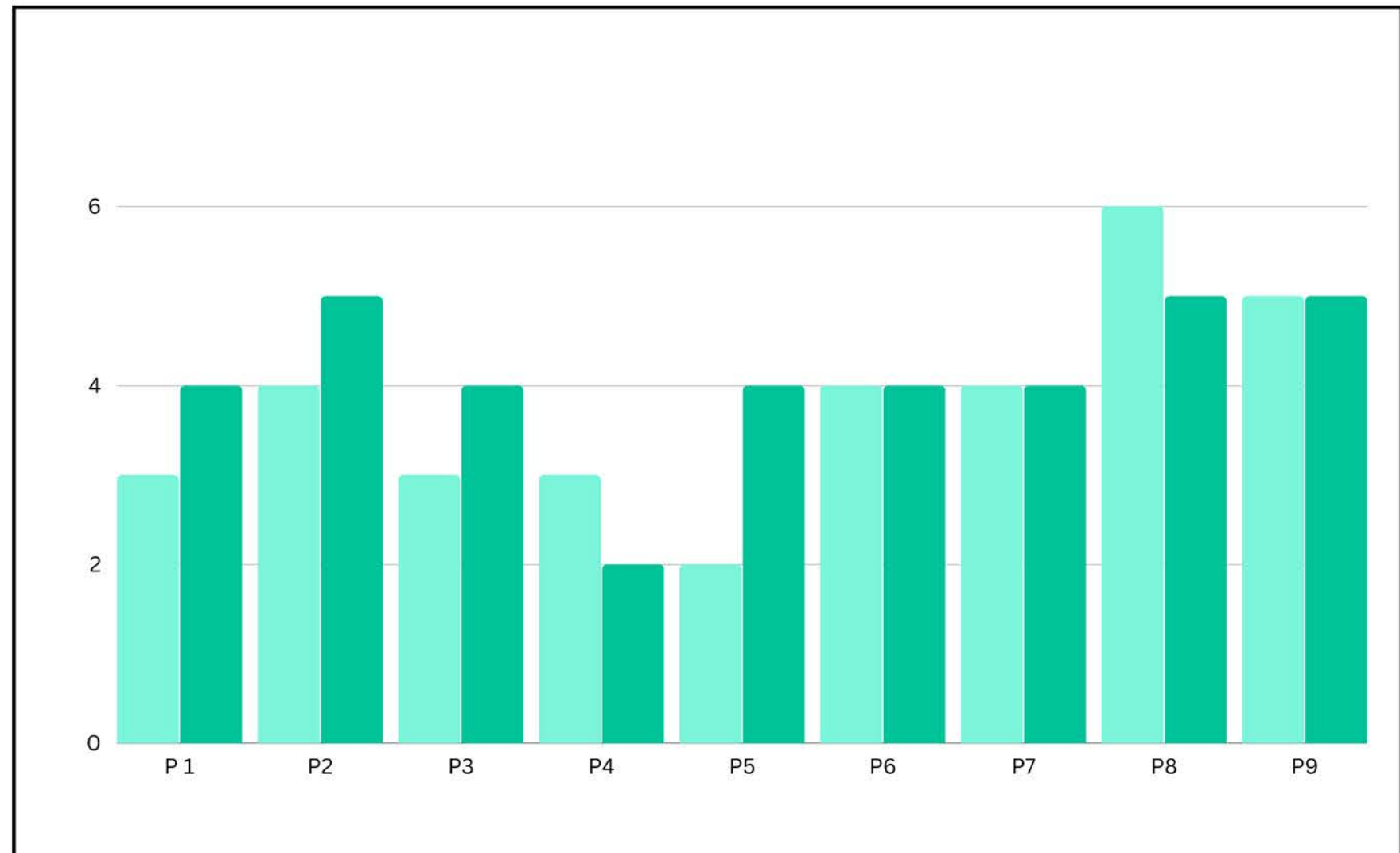
The results gathered did not show statistical significance between pre- and post-survey scores for the standard PowerPoint lecture and the AE lecture.

### Retention

AE PowerPoint



Standard PowerPoint



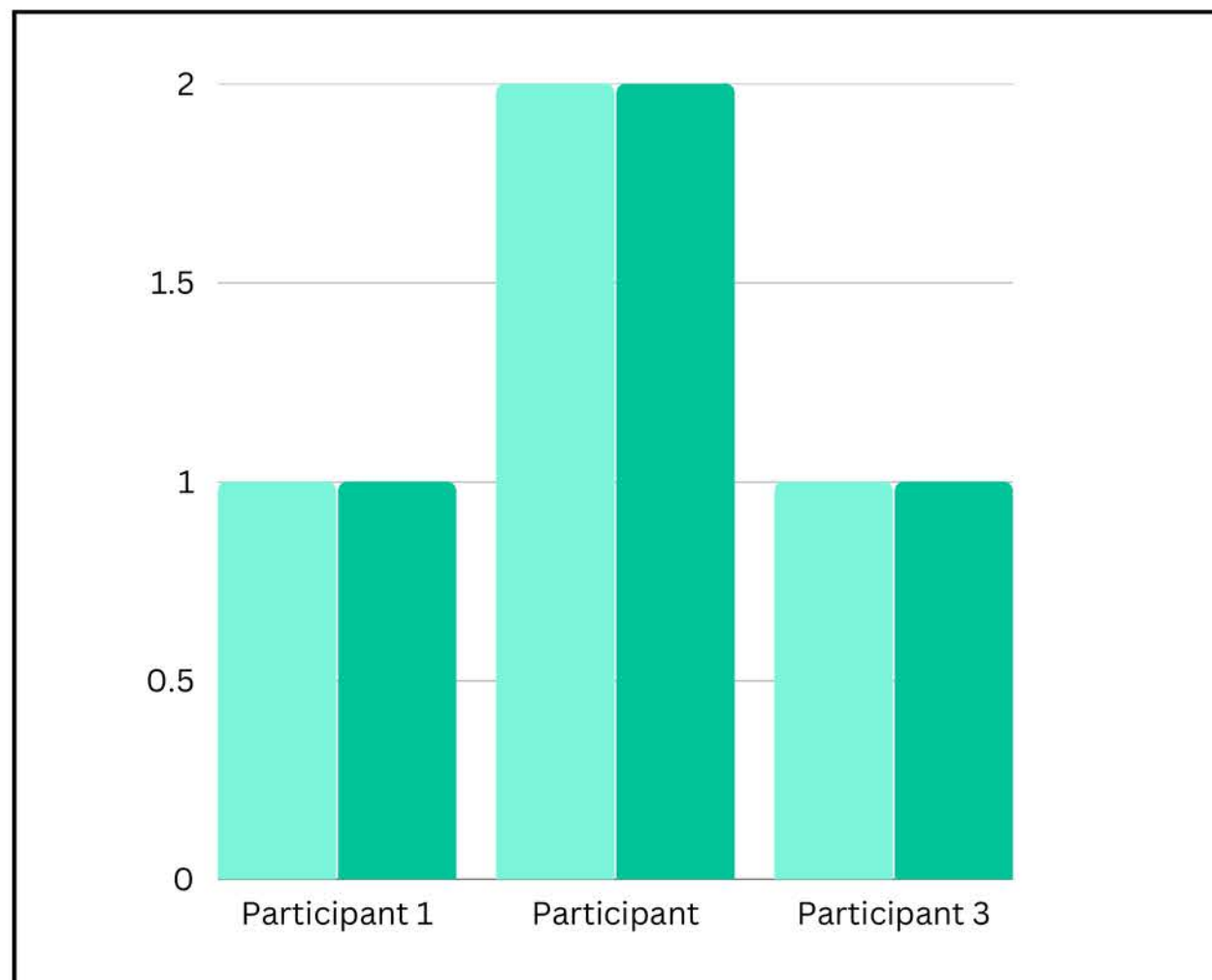
Pre-survey scores      Post-survey scores

## VI Results

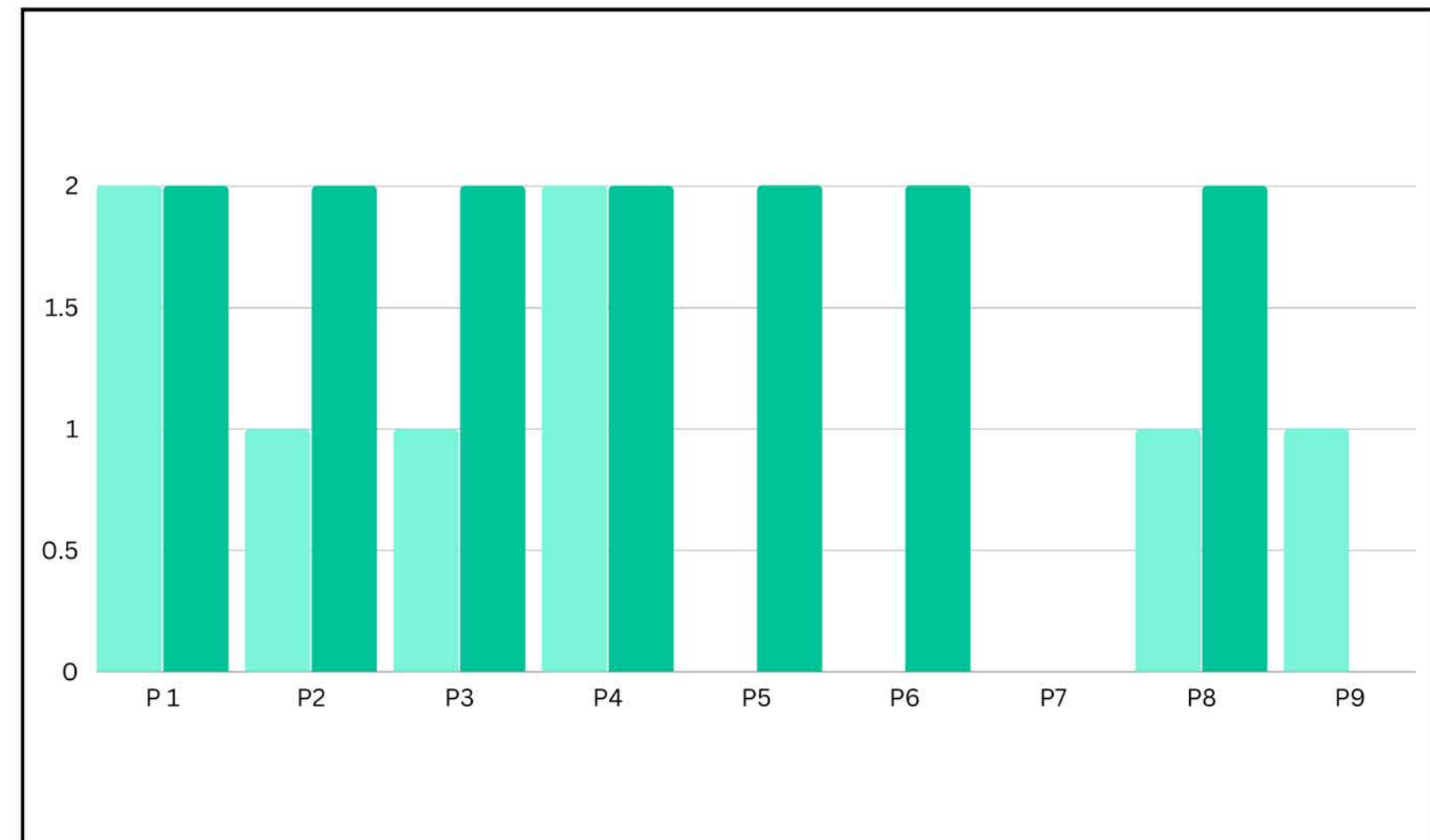
The results gathered did not show statistical significance between pre- and post-survey scores for the standard PowerPoint lecture and the AE lecture.

### Transfer

AE PowerPoint



Standard PowerPoint



 Pre-survey scores

 Post-survey scores

## VI Results

Despite statistically insignificant results, this research still points to the valuable idea that purposeful images matter most in presentations.

### Feedback for Standard PowerPoint

"Pictures!! "

"The format layout pics was very helpful "

"I liked how there was a visual picture always there when the explanation of the topic of occurring This helped connect the dots and see the information. "

### Feedback for AE PowerPoint

"The visual pictures helped a lot to follow along with the presenters words. "

"It was a good and to the point lecture "

"I didn't feel like the formatting of the PowerPoint was different from typical presentations, the oral presentation is what jogged my memory of thoracic anatomy"

The biomedical communications field teaches people about science, so research that examines the core principles of teaching is very important.



### Limitations

Single researcher

Small time frame



### Implications

Visuals are important

Closes the research gap



### Future applications

Critique teaching traditions

Springboard more research



## VIII Cited Literature

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MONDAY, MAY 24, 2023

Biomedical Visualization, UIC

STUDENT RESEARCHER

Laurel Moore

ADVISOR

Kelly Cloninger, MS

**Thank you  
for listening!**



## IX Bonus slides: AE style guide

### AE style guide (Alley, 2003)

<b>Formatting</b>	<b>Visuals</b>	<b>Type</b>	<b>Organization</b>	<b>Speech</b>
Mapping, Transition, Content and Conclusion slides must all have an assertion (thesis) statement and visual evidence	Use visuals that support the assertion argument and speech – show key results or diagrams – and help define the slide’s purpose	Arial or a sans serif bold for assertions	Organize and outline content based on learning goals for the presentation	For each assertion, speak for about 1 minute of time, especially in longer presentations
Mapping slides organize content into chunks with icons and labels.	No clip art	Use 32-36 pt font for title slides. Use larger font for bigger room/audience (over 100 people)	Use 1 title slide, 1 mapping slide, 1 transition slide for every section of content, content slides, and 1 conclusion slide (More in depth slide breakdown in Table 4)	Create depth of information based on audience demographics and needs
Assertions should not be more than 2 lines.	Make sure images pass contrast check	28-38 pt font for assertions on content and mapping slides, size depending on audience/room	Break down topic into 2-4 categories, if possible	Plan out dialogue points
Use contrasting background color to text color		No all capitals or underline text	Keep lists less than 4 items if possible	Fashion sentences on the spot when possible
Don’t clutter slides, more white space is optimal		Use 14 pt font for references	Instead of bullets, indent content under headings	Practice talk before giving lecture
Use solid colors for backgrounds. No textured or gradient backgrounds				

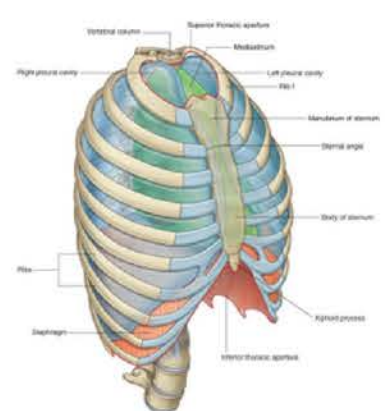
### AE slide types (Alley, 2003)

<b>Slide Type</b>	<b>Slide order</b>	<b>Question Slide Answers</b>	<b>Contents of slide</b>	<b>Slide purpose</b>
Title slide	First slide	What is the subject? Why is this subject important?	<ol style="list-style-type: none"> <li>1. Presentation’s title</li> <li>2. Information about the speaker (name, affiliated institution)</li> <li>3. Date of talk</li> <li>4. Institution logo</li> <li>5. One image that holds importance to the talk</li> </ol>	Orients the audience to the subject of the talk and gives credibility to the speaker
Mapping Slides	After title slide	What is the subject? What order will the slides be in?	<ol style="list-style-type: none"> <li>1. Summary sentence of what topics the presentation will cover</li> <li>2. Content section headings</li> <li>3. Image for each section heading that holds importance to that section</li> </ol>	Summarizes the pace and content organization of the talk
Transition Slides	First slide of each new section	What is the subject? What order are the slides in?	<ol style="list-style-type: none"> <li>1. Small image in top left corner that was used to visualize each section heading on the mapping slide</li> <li>2. One assertion</li> <li>3. Visual evidence that supports the assertion</li> </ol>	Prompting audience to section content change
Content Slides	After mapping slide and each transition slide	What is needed to understand the subject?	<ol style="list-style-type: none"> <li>1. Assertion sentence</li> <li>2. Visual Evidence</li> </ol>	Provides content that helps audience complete the learning goals of the presentation
Conclusion Slide	Last slide	What is the subject? Why is this subject important?	<ol style="list-style-type: none"> <li>1. Summary statement that covers the overarching thesis of the talk. Sentence begins with “In</li> </ol>	Slide reiterates the important content of the talk and overall purpose

# IX Bonus slides: AE style guide // Sample Slides

## Title

**Anatomy of the Thoracic Cavity**



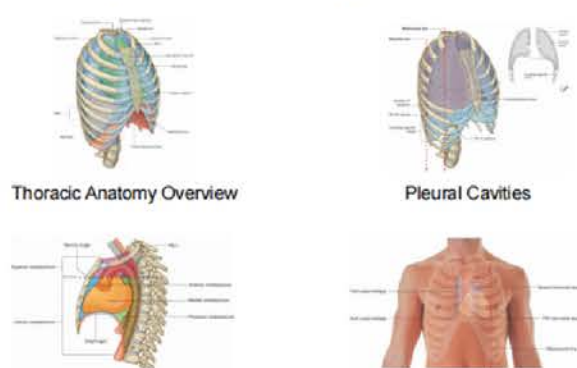
Laurel Moore  
University of Illinois at Chicago  
March 3, 2023

UIC UNIVERSITY OF ILLINOIS CHICAGO

Gray's Anatomy for Students, Thorax, Fig. 3.7

## Mapping

**This presentation focuses on the anatomy of the thoracic cavity and important clinical applications.**

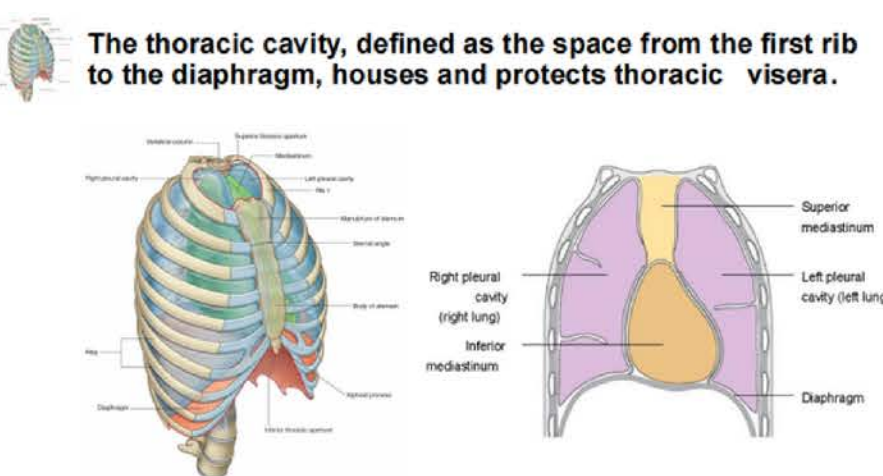


Thoracic Anatomy Overview      Pleural Cavities

Mediastinum      Clinical Applications of Surface Landmarks

## Transition

**The thoracic cavity, defined as the space from the first rib to the diaphragm, houses and protects thoracic visera.**



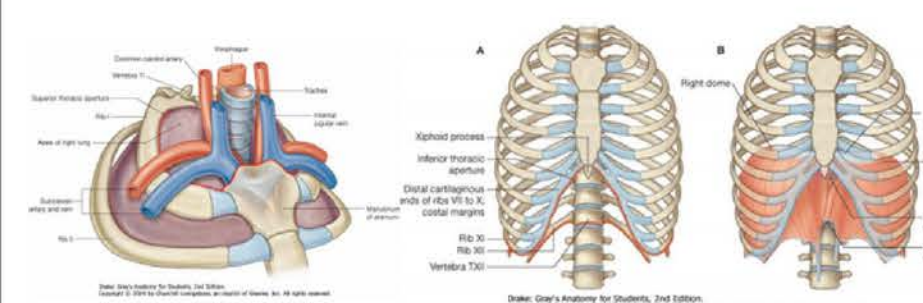
Right pleural cavity (right lung)  
Inferior mediastinum

Superior mediastinum  
Left pleural cavity (left lung)  
Diaphragm

Gray's Anatomy for Students, Thorax, Fig. 3.7      Thieme Atlas of Anatomy, Thorax, Fig. 6.1

## Content

**The boundaries of the thoracic cavity are delineated by the superior and inferior thoracic apertures.**



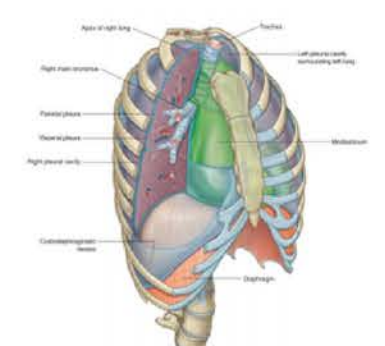
Superior thoracic aperture  
Inferior thoracic aperture

Xiphoid process  
Right dome  
Central tendon  
Left dome  
Esophageal hiatus  
Aortic hiatus

Gray's Anatomy for Students, Thorax, Fig. 3.3      Gray's Anatomy for Students, Thorax, Fig. 3.4

## Conclusion

**In summary, the thoracic cavity holds and protects important cardiopulmonary visera.**



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Gray's Anatomy for Students, Thorax, Fig. 3.6