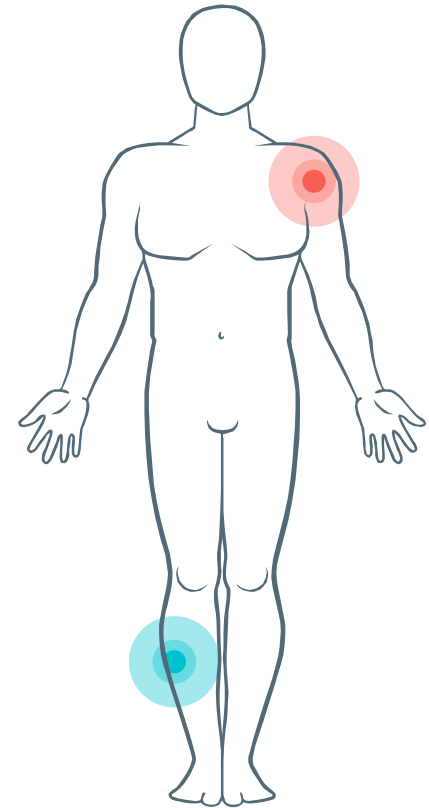


## Before we start

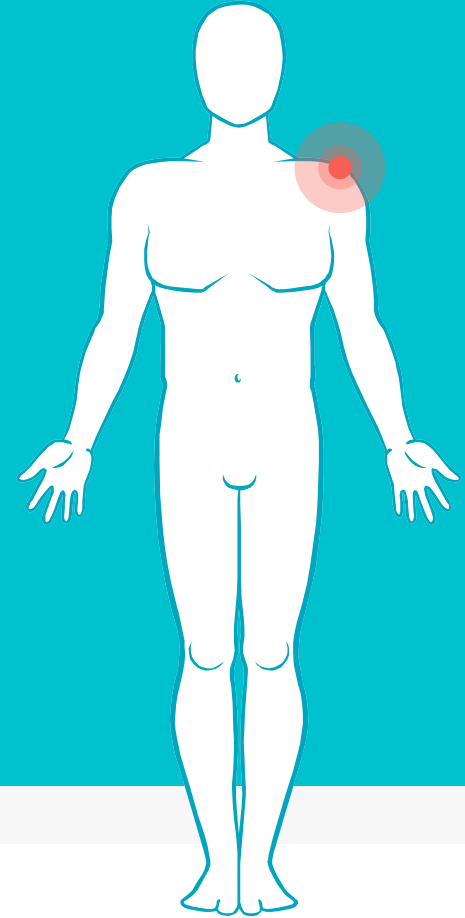
### Activity: What's in your heart?

Can you identify the largest chamber, pulmonary veins, and aorta?

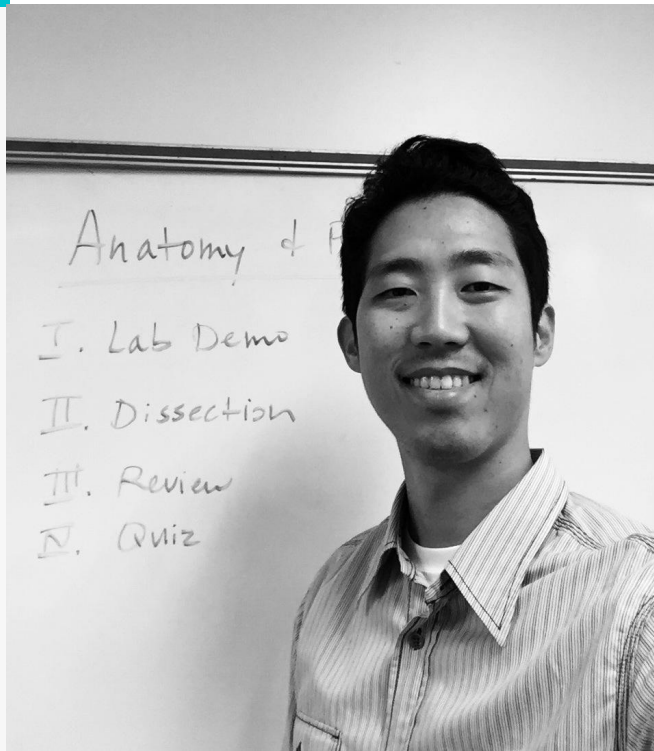
- ▶ Capture a screenshot for each structure above
- ▶ Upload three images to Twitter @ARdissectionHI
- ▶ View responses; Know thy heart



# AUGMENTED DISSECTION



Action Research Project integrating Anatomy 4D



# HELLO!

**My name is Joshua  
Jeong**

LTEC Master's Candidate  
University of Hawai'i Manoa

Anatomy & Physiology Instructor  
UH Kapi'olani CC



# Agenda

**Purpose &  
Background**

**Results &  
Insights**

**Design &  
Development**





# Agenda

**Purpose &  
Background**



**Results &  
Insights**



**Design &  
Development**



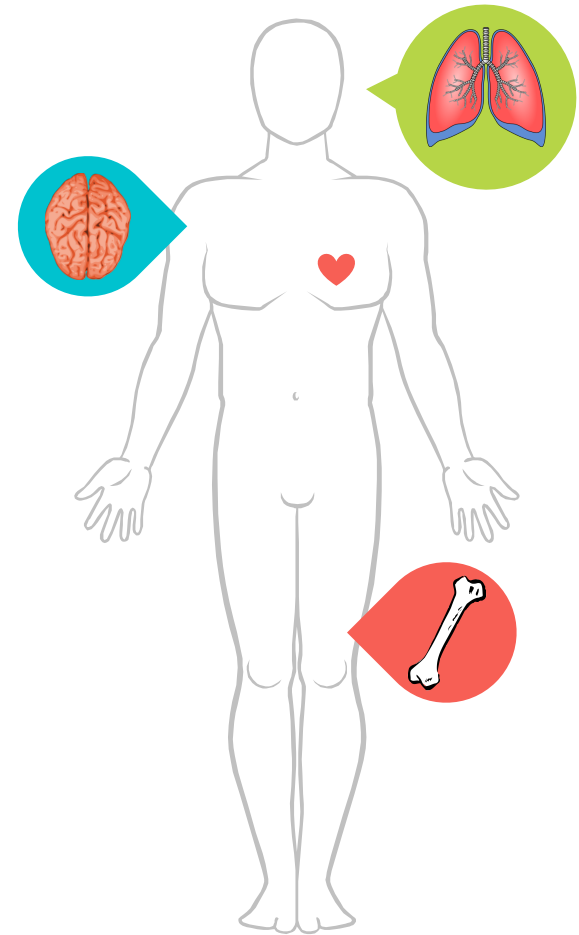
# Purpose

## Action Research

- Evaluate impact of Anatomy 4D
- Determine
  - Viable learning tool
  - Learner pros and cons
- For A&P laboratory students

# What is anatomy & physiology?

- ▶ Study of structures
- ▶ Study of functions or processes
- ▶ Deeper introspection



*How many of you have performed  
a dissection before?*

”



## What is augmented reality?



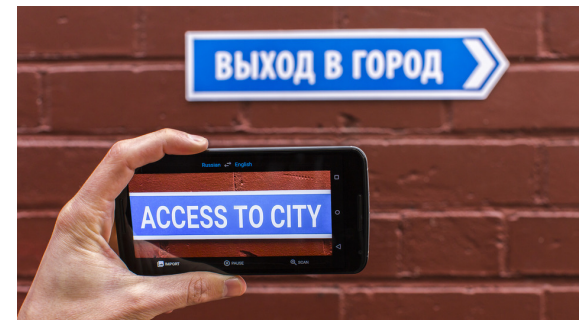
- Enhanced version of reality created by use of technology
- Typically involves tablet and cell phone camera
- Overlaying digital information on an image being viewed through a mobile device
- Applications in numerous fields - military, advertising, healthcare, architecture

Augmented Reality Seen & Heard

Pokemon Go

Google Translate

Audi Owner's Manual



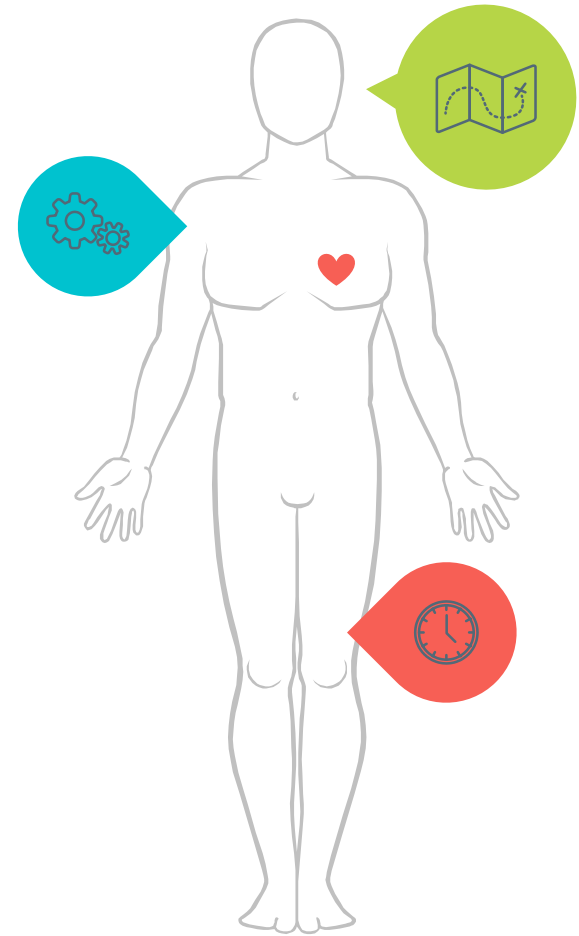
## What is Anatomy 4D?

- ▷ Available gratis
- ▷ Human body and heart organ objects projected in real physical world
- ▷ Opportunity to view body systems in depth
- ▷ Education enhancement



# ANATOMY 4D

# Project Rationale





## A&P Learning Outcomes

- 1.) Describe interrelationships between body cells, tissues, organs, and systems
- 2.) Identify anatomical structures and physiological mechanisms in relation to homeostasis and pathologies
- 3.) Recognize essential steps in problem solving and learning
- 4.) Interact in a quality manner with classmates

*Knowing is not enough; we must  
apply  
Being willing is not enough; we  
must do.  
~Leonardo da Vinci*

”



## Faculty & Facility Concerns

### ▷ Cost

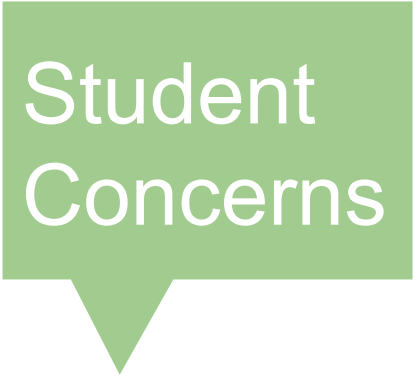
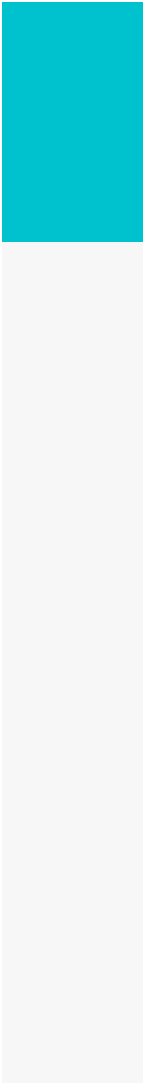
- ▶ Purchasing & shipping wet specimens

### ▷ Facilities

- ▶ Properly housing & maintaining specimens

### ▷ Quality

- ▶ Specimens are not uniform - missing structures, poor condition



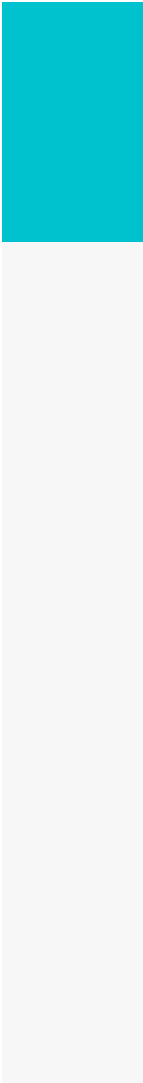
## Student Concerns

Safety: accidental incision, wounding;  
wet floor conditions

Cost: Purchasing separate dissection kits,  
additional gloves, close-toed shoes

Personal Health: Formaldehyde - classified  
as probable human carcinogen under  
conditions of prolonged exposure





How can I  
resolve cost,  
facility,  
limitation  
issues?

How can I  
increase  
motivation and  
enthusiasm for  
dissection?

How can I  
help  
learners  
remember  
more?



Augmented  
Reality  
+  
Anatomy 4D  
+  
Constructive  
Lesson  
=  
**YES!**



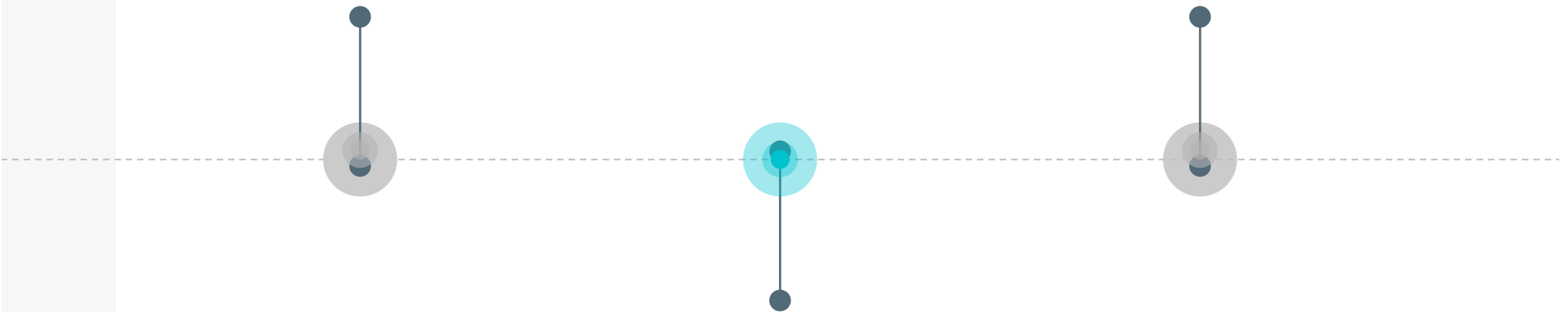


# Agenda

**Purpose &  
Background**

**Results &  
Insights**

**Design &  
Development**

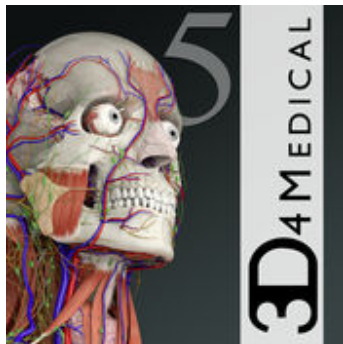




## Planning Process

1. Decide learning strategy, theory, approach.
2. Find resources to implement AR dissection.
3. Choose an anatomy tool that meets criteria.
4. Create research instruments – survey & tests.
5. Create 1 week AR dissection activity.

## Tested Apps



ANATOMY 4D



# Augmented Dissection Lesson Organization

**M1: Cardiovascular & Endocrine Labs**

Heart Dissection

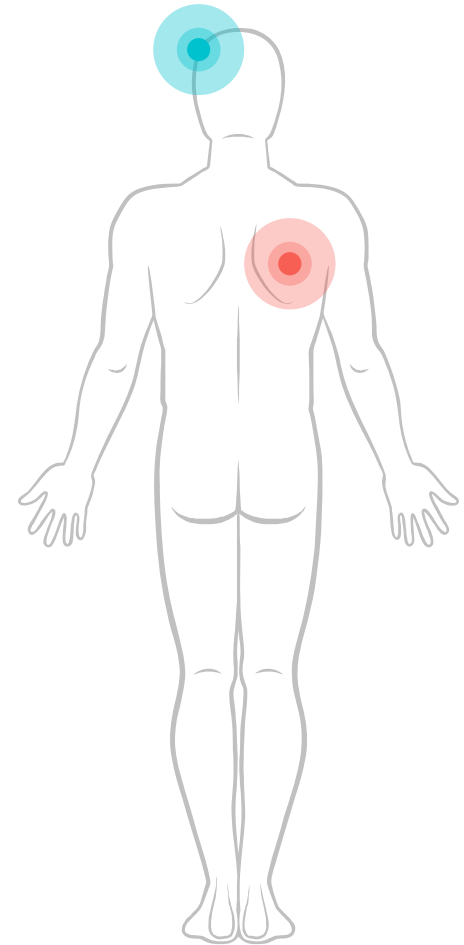
Modules

Learning Objectives

- Describe major functions and processes of heart chambers, major arteries and veins, coronary circulation
- Identify and describe gross & microscopic of the heart organ, contraction phases, and integral role in circulatory
- Envision clinical scenarios in which real heart dissection and identification may be significantly relevant (open-he
- See the unseen via augmented learning technology in place of hands-on organ dissection

Dissection Procedure

- 1.) Complete voluntary pre-dissection [test](#) prior to beginning assignment to check your current understanding
- 2.) Download app - Anatomy4D [see forum]
- 3.) Take screenshots; label and edit screenshots in Skitch app or upload to web based editor such as Google Draw
- 4.) Create final dissection deliverable with web tools [Powtoons, Slides, Piktochart, Voicethread etc.] by Sunday, Febru
- 5.) Upload a shared link to your final deliverable to Virtual dissection forum by Sunday, February 12, 11:59 PM.
- 5.) Respond to **two** peer dissections and provide feedback on perspectives gained, shared, or expanded by Sunday, 1
- 6.) Complete voluntary post-dissection [survey](#) and post-dissection [test](#) by Sunday, February 19, 11:59 PM.



# Augmented Dissection Lesson Organization

## Augmented Dissection

Human Anatomy & Physiology Lab II  
Overview Presentation

### Assignment Description & Goals

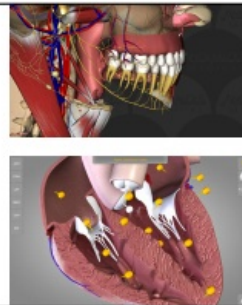
- ★ Familiarize learners (you) with anatomy educational technology
- ★ Enhance identification of human body structures via mobile phone application
- ★ Apply pre-existing anatomy knowledge during organ and human body orientation (directional terminology, clinical connections)
- ★ Imagine future applications and scenarios involving identified structures and functions
- ★ Create individual deliverables of high quality demonstrating greater understanding



### Methods - 3 Phases

- ★ **OBSERVE**
  - Capture screenshots of significant structures via Anatomy 4D app
- ★ **CREATE**
  - Animate screenshots
  - Make a presentation consisting of 8 slides
- ★ **SHARE**
  - Upload presentation to discussion board/forum
  - Provide peer-feedback

\*Further instructions and grading can be found in lecture forums.

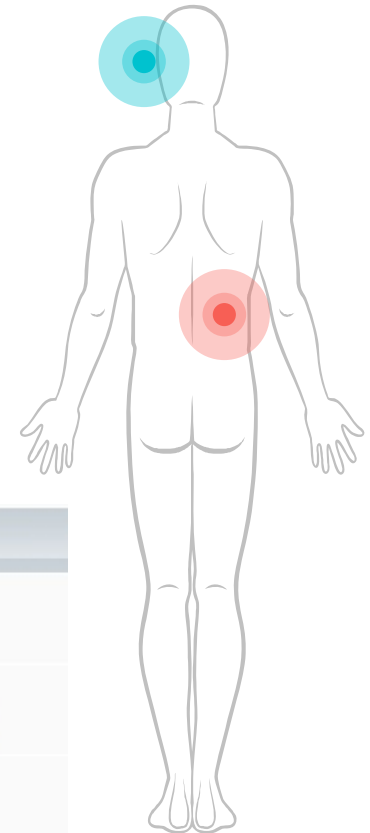


### Anatomy4D - Highlights & Features

- ★ Navigation in three dimensions
- ★ Flexible movements
- ★ Fade systems or structures individually
- ★ Layering effect - superficial to deep
- ★ Sounds effects, i.e. heart beating
- ★ Structures not pre-labelled
- ★ Download either Android or iOS (Google Play store or Apple App store to phone or tablet)
- ★ Brief Demo: <https://youtu.be/vixG7RTX50k>



# Augmented Dissection Lesson Organization



## e-Dissections

 **Atria and Ventricles - Share & Respond** - Due: Feb 17, 2017 11:59 PM

Use this forum to share your deliverable and provide feedback to peers.

 **Atria and Ventricles - Quizzes & Survey** - Due: Feb 19, 2017 12:00 PM

Find links and instructions to additional AR dissection activities to assess impact and check understanding.

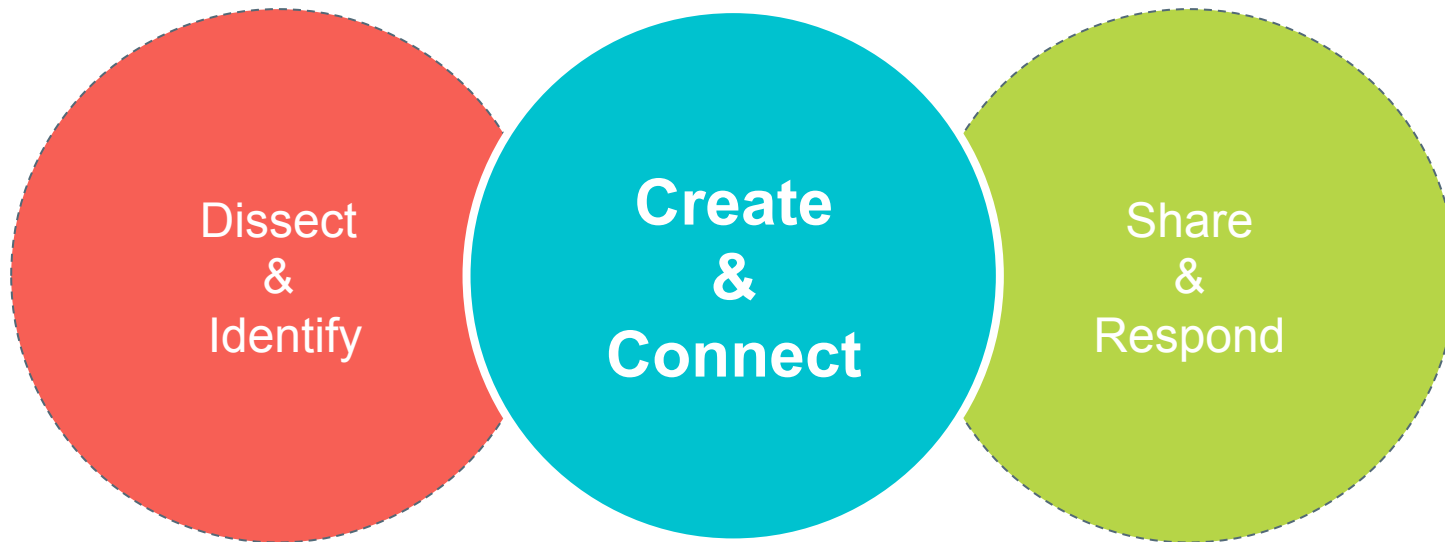
 **Renal and Retro - Share & Respond** - Due: Apr 30, 2017 11:59 PM

Use this forum to share your deliverable and provide feedback to peers.



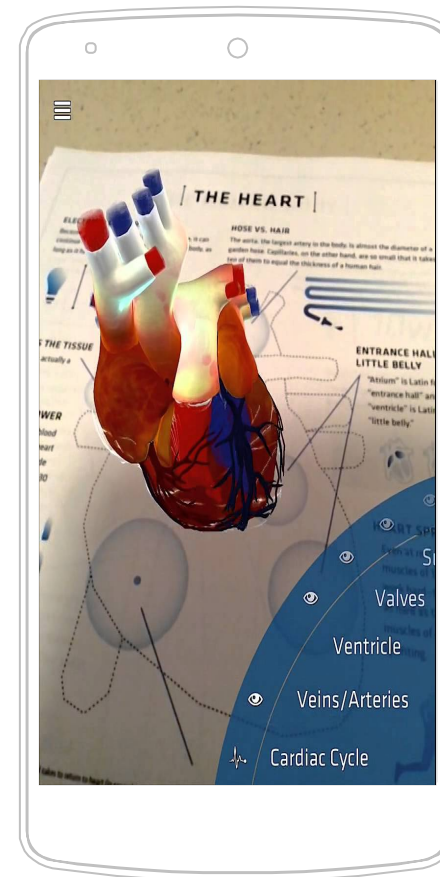


## Assignment – 3 Main Phases



## Phase 1 - Dissect & ID

1. Open Anatomy 4D app
2. Capture 3 screenshots of heart structures
3. Capture 2 screenshots endocrine/immune
4. Capture 2 screenshots retrospect body systems



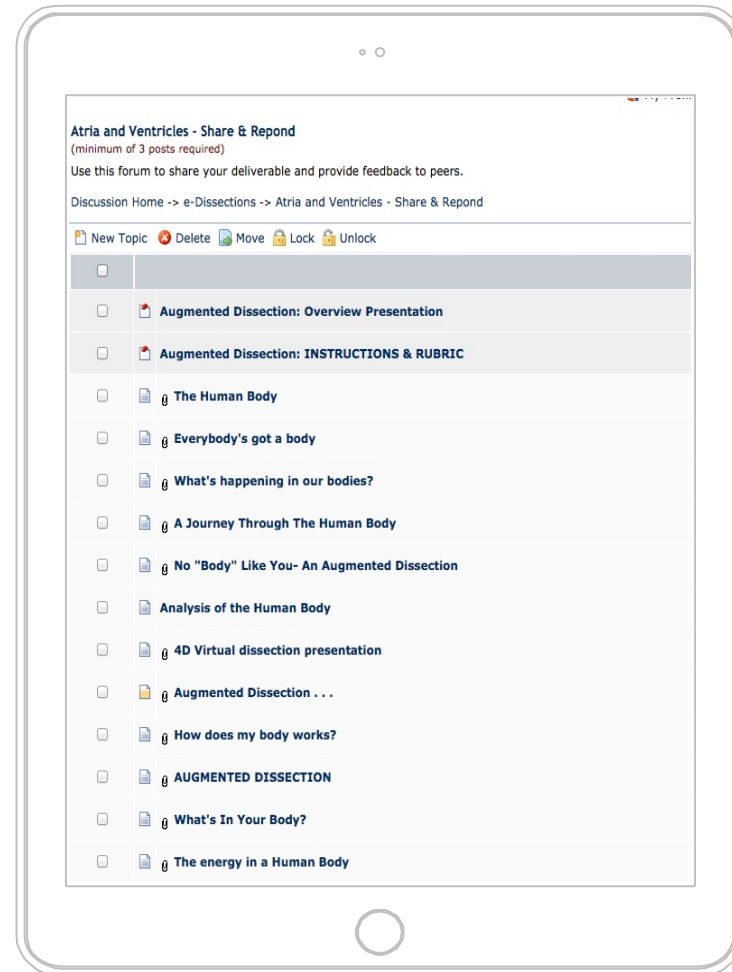
## Phase 2 - Create & Connect

1. Annotate screenshots
2. Insert screenshots to presentation
3. Provide further details
4. Minimum 9 slides - intro & references included



## Phase 3 - Share & Respond

1. Upload slides to forum
2. Review at least two presentations
3. Provide feedback



# Dissection Assessments

## Pre & Post Tests

- ▷ 15 questions; 15 minutes
- ▷ Content areas w/ picture questions
- ▷ Multiple choice

## Post-Survey

- ▷ 58 questions; 20 minutes
- ▷ 5 point Likert Scale
- ▷ Open-ended questions

Section 2 of 8

### Engagement

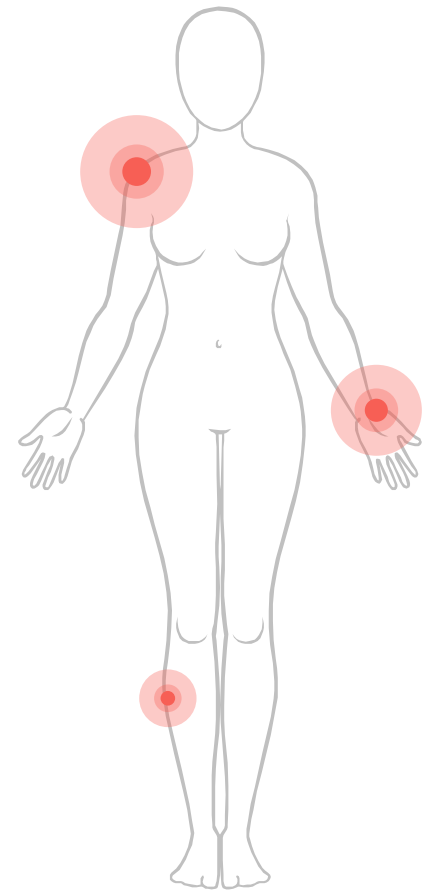
Please respond to how much you agree with each statement below on a scale of 1 to 5 with 1 being NOT AT ALL and 5 being VERY MUCH for you as a student in these A&P courses.

I was comfortable with the augmented dissection. \*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very Much

What I needed to do for the augmented dissection was clear. \*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very Much



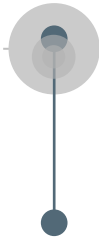


# Agenda

**Purpose &  
Background**

**Results &  
Insights**

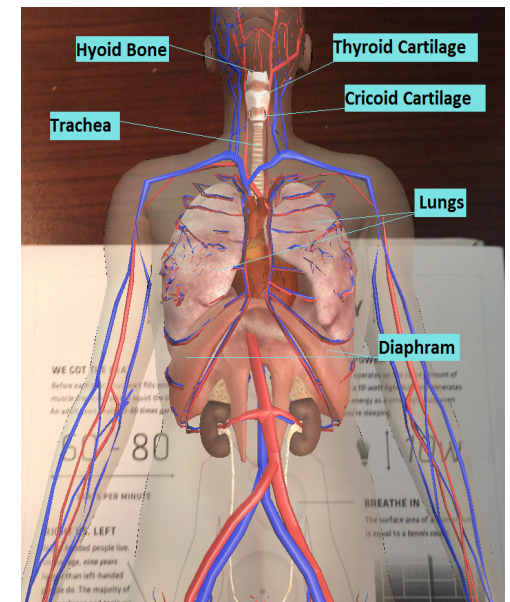
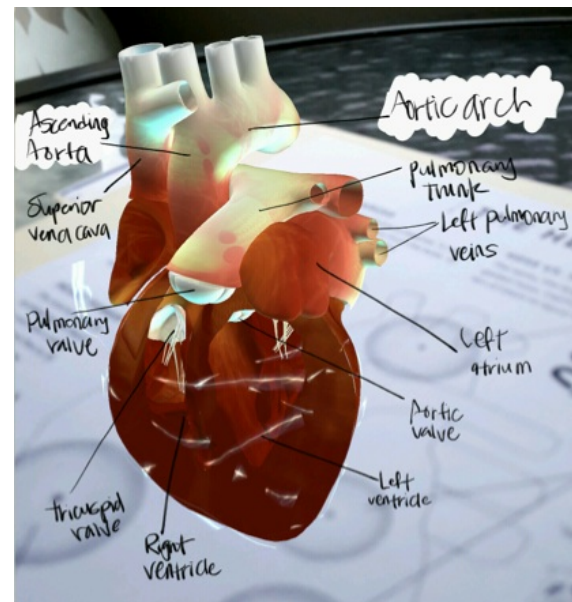
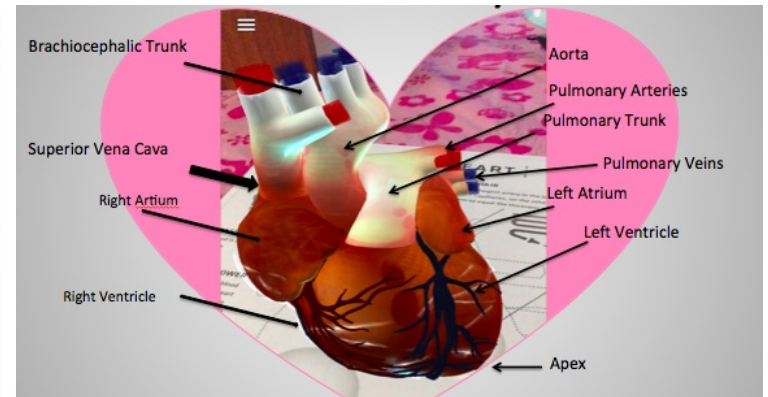
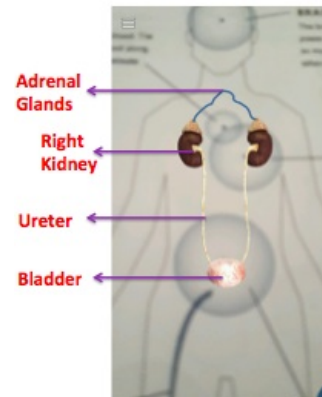
**Design &  
Development**



# Student Deliverables

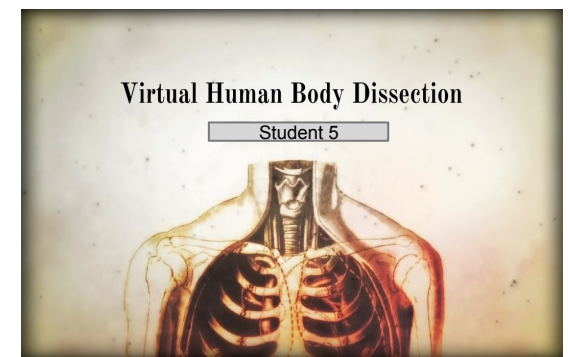
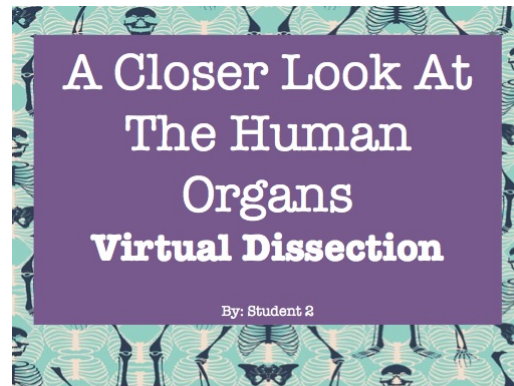
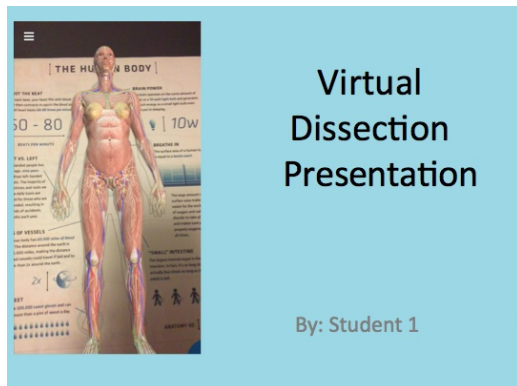
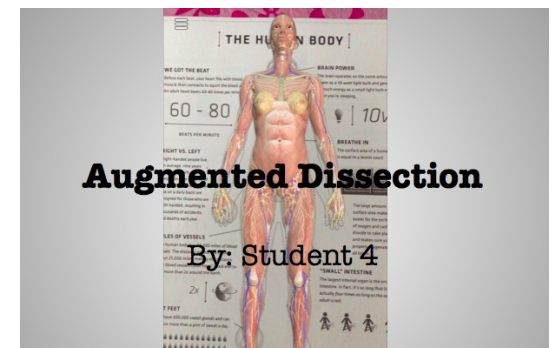
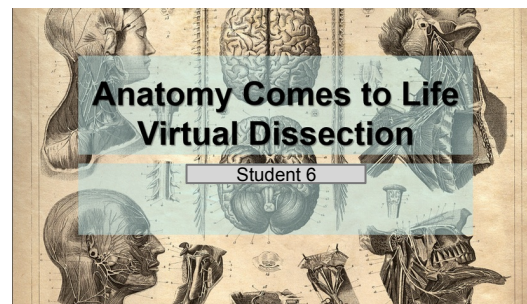
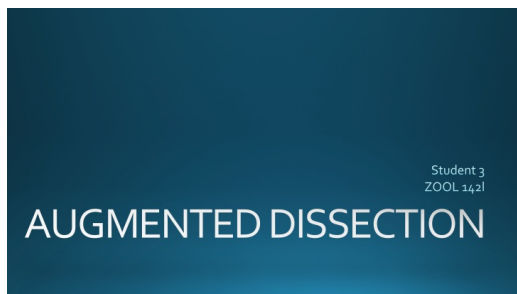
Screenshots  
w/student  
generated labels

Recommended tools:  
Google Draw  
Skitch





# Student Deliverables

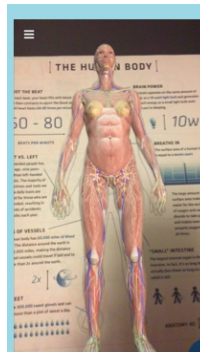




# Student Deliverables

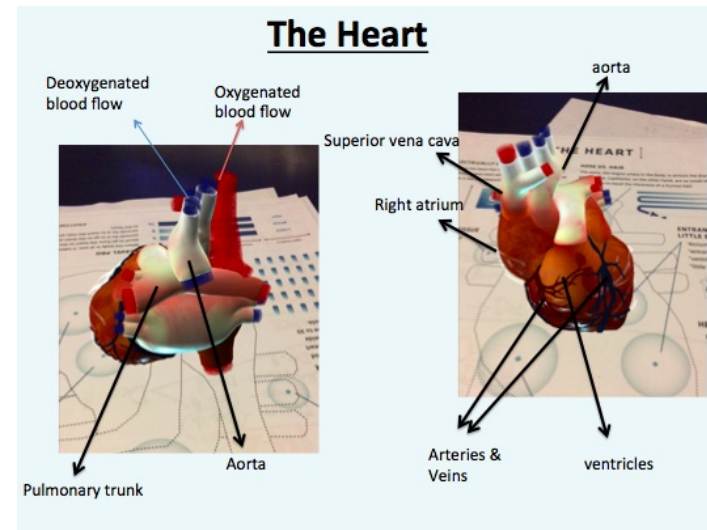
## Student Example #1

- Google Slides
- Arrow labels
- External referencing

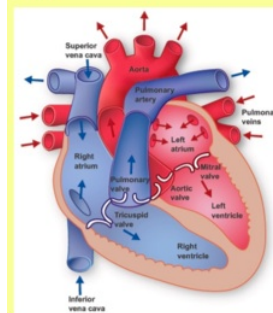


## Virtual Dissection Presentation

By: Student 1



The heart is a muscular organ that pumps blood throughout the body via the circulatory system, supplying oxygen and nutrients to the tissues. It is located on the left side of the chest between the lungs.

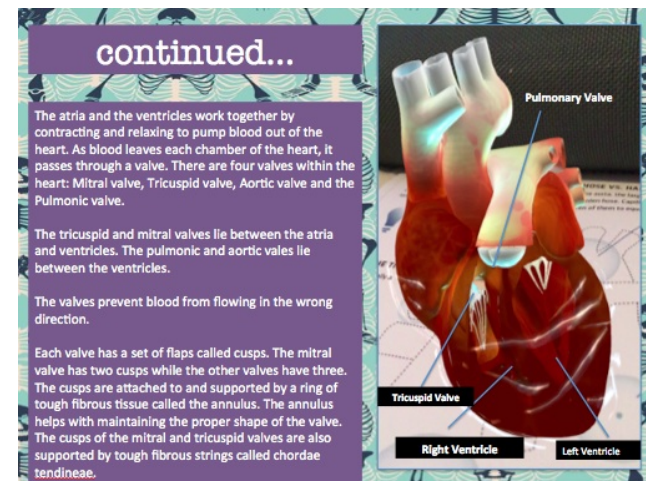
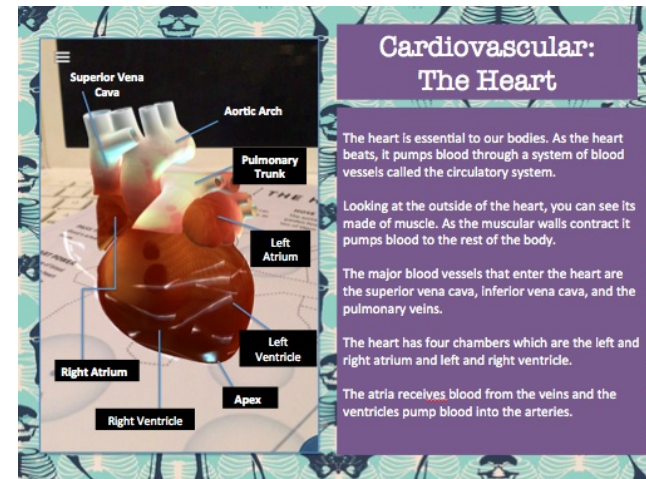
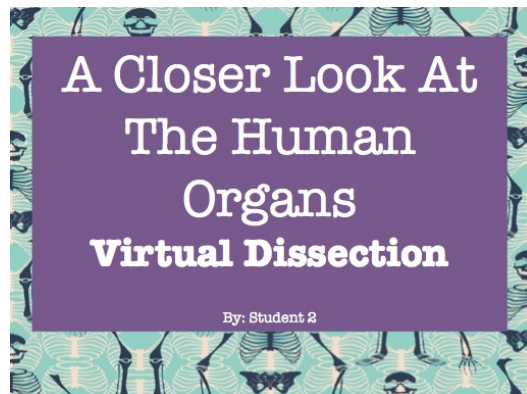


Anatomy	Function
Left & Right Atria	Chambers that receive blood returning from the body through veins
Left & Right Ventricles	Chambers where blood is pumped to the body through the arteries
Mitral Valve	Controls the flow of oxygenated blood from the left atrium to the left ventricle
Tricuspid Valve	Controls the flow of deoxygenated blood from the right atrium to the right ventricle
Aortic Valve	Controls flow of oxygenated blood from the left ventricle to the body
Pulmonary Valve	Controls flow of deoxygenated blood from the right ventricle to the lungs

# Student Deliverables

## Student Example #2

- ▷ Google Slides
- ▷ Highlighted labels
- ▷ Highly descriptive



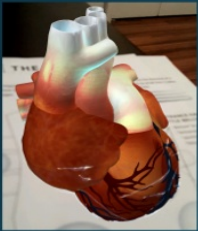
# Student Deliverables

## Student Example #3

- ▷ Powerpoint Online
- ▷ Functions & facts
- ▷ Comparison chart



### CARDIOVASCULAR & HEART



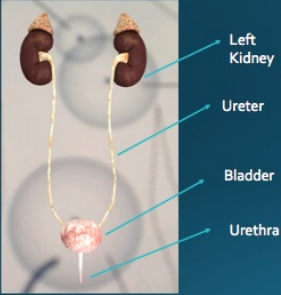
**FUNCTIONS:**

- The heart is an organ that pumps blood throughout the body via the circulatory system, supplying oxygen and nutrients to the tissues and removing carbon dioxide and other wastes.
- Some functions of the heart and cardiovascular system are: transport gases, nutrients, wastes and hormones.
- The heart is about the size of a fist and weighs less than a pound.
- Your entire volume of blood goes through your entire body once every minute.
- Your heart beats 100k times and pumps about 2k gallons of blood daily.

**INTERESTING FACTS:**

- The heart beat is strong enough to squirt blood 30 feet
- The longer a boy's ring finger is, the less likely they are to have a heart attack (according to a study)
- The human heart beats about 35 million times per year.
- The heart pumps about 1M barrels of blood in a lifetime.

### RENAL/URINARY SYSTEM



**Female Urinary System**

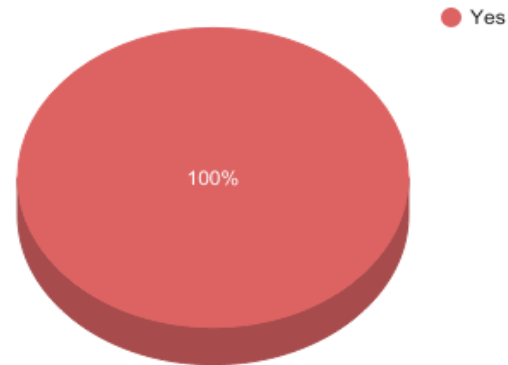
**Male vs. Female Urinary/Renal systems:**

Male Urinary System	Female Urinary System
Connected to the reproductive system	Not connected to the reproductive system
Transports semen and urine	Transports urine
Urethra is 10 to 15 centimeters	Urethra is 3 to 4 centimeters
Passes the prostate, internal and external sphincters, urogenital diaphragm, Cowper's gland, and the entire length of the penis	Passes the neck of the bladder, internal and external sphincters, and urogenital diaphragm
Rarely has urinal infections	Urinal infections are common

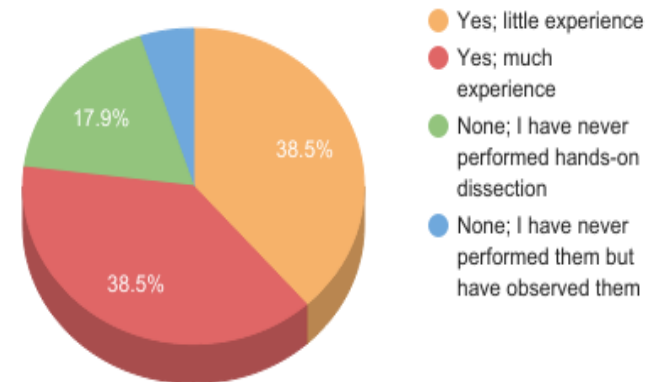
## Post Survey

## Previous Experience

Have you taken an anatomy course before?



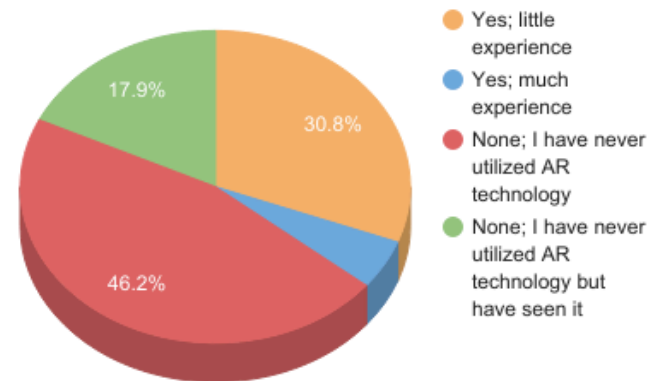
Do you have prior dissection experience?



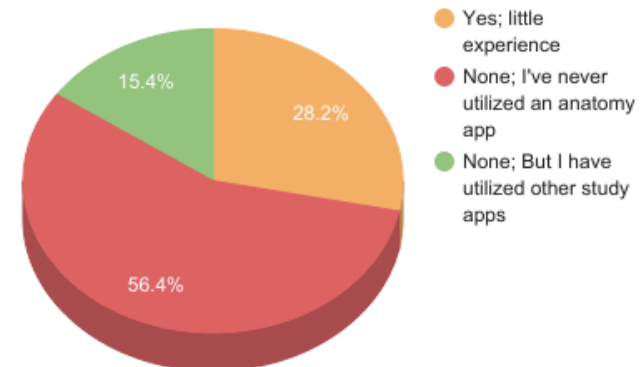
## Post Survey

## Technology Experience

**Do you have prior experience using AR technology?**



**Do you have prior experience using apps for human body visualization?**

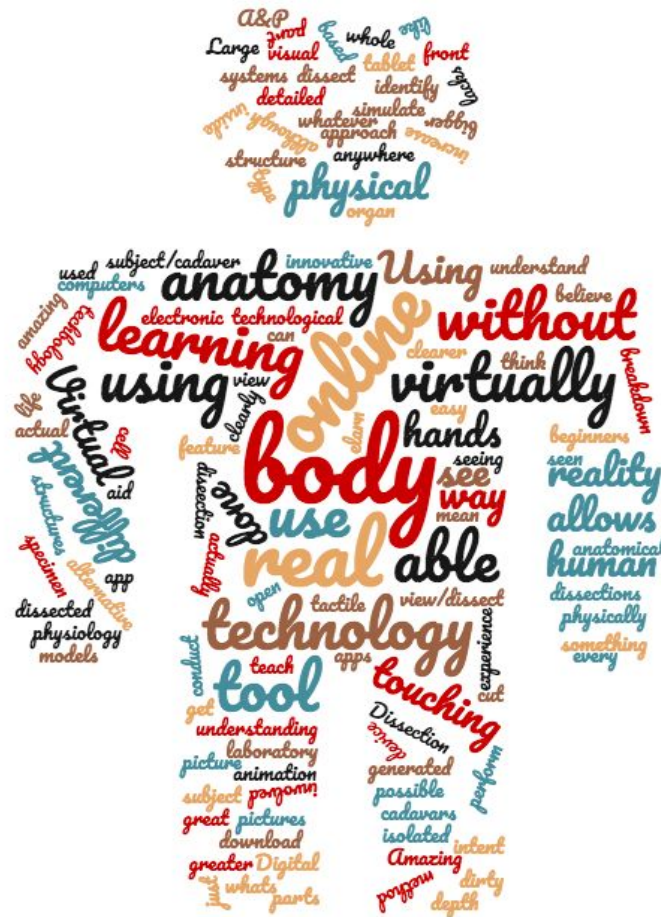




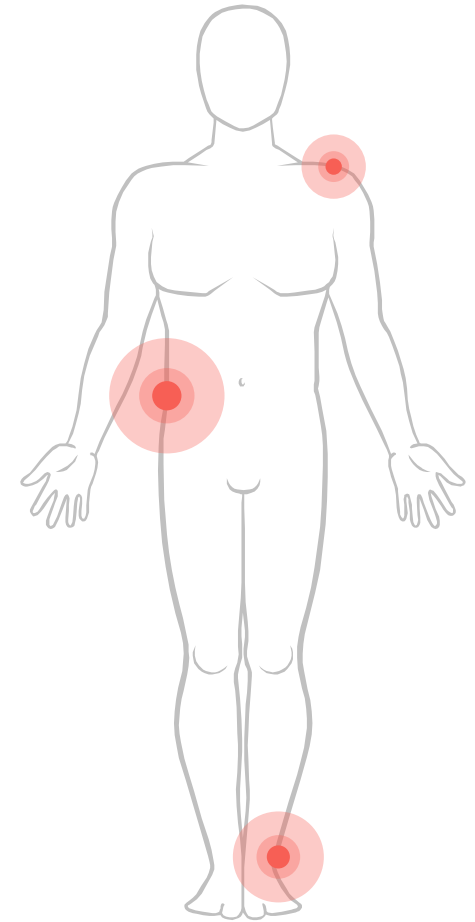
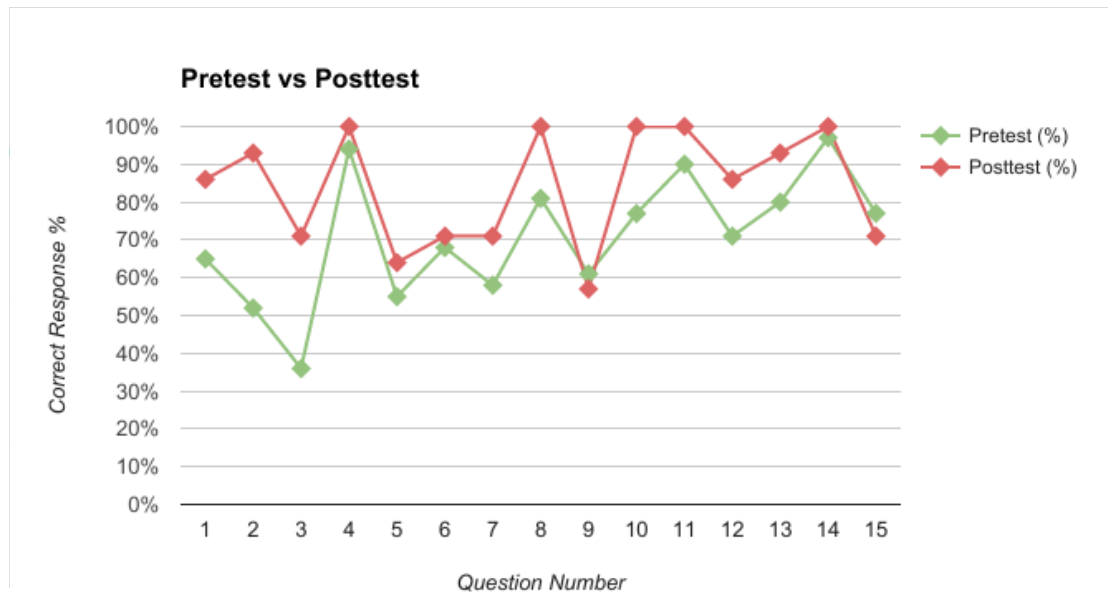
100

# Post Survey

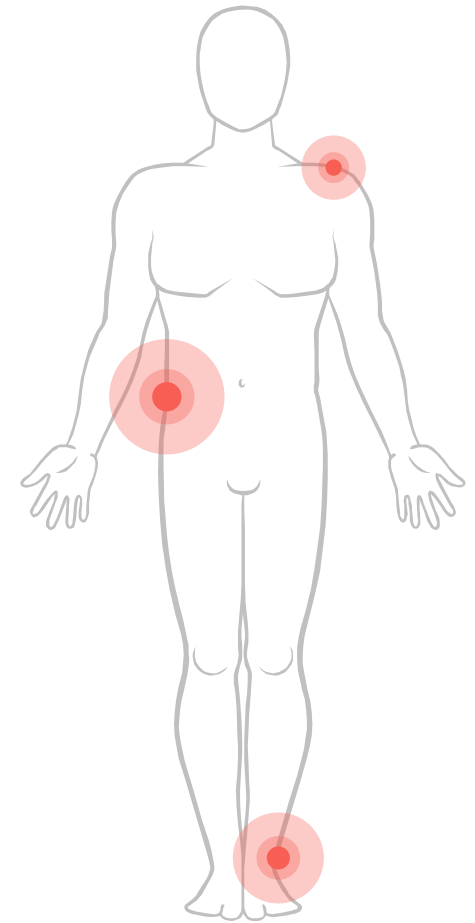
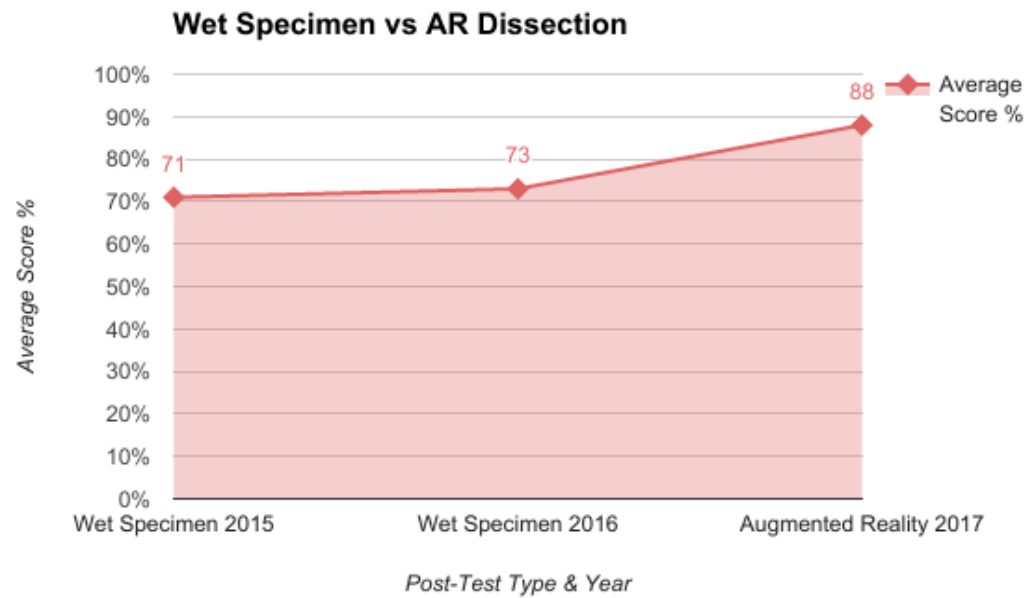
## Word cloud defining AR dissection



## Pre-Test vs Post-Test



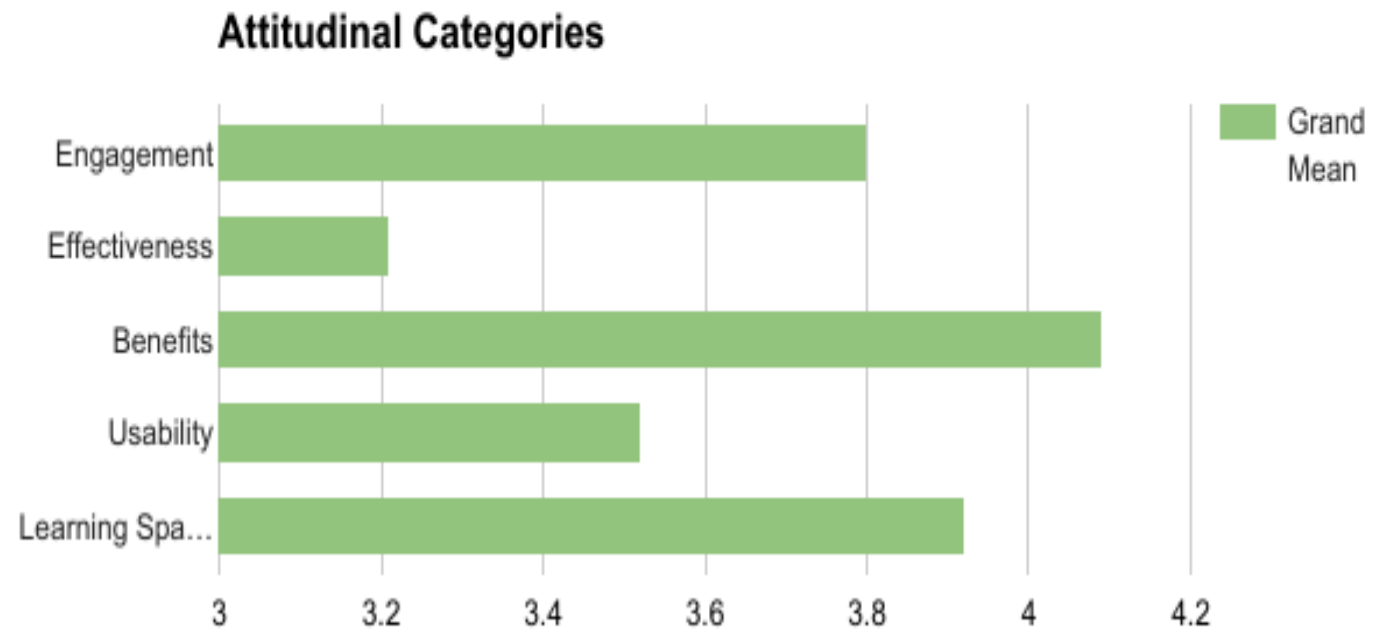
## Wet Specimen vs AR Post-Tests





## Post Survey

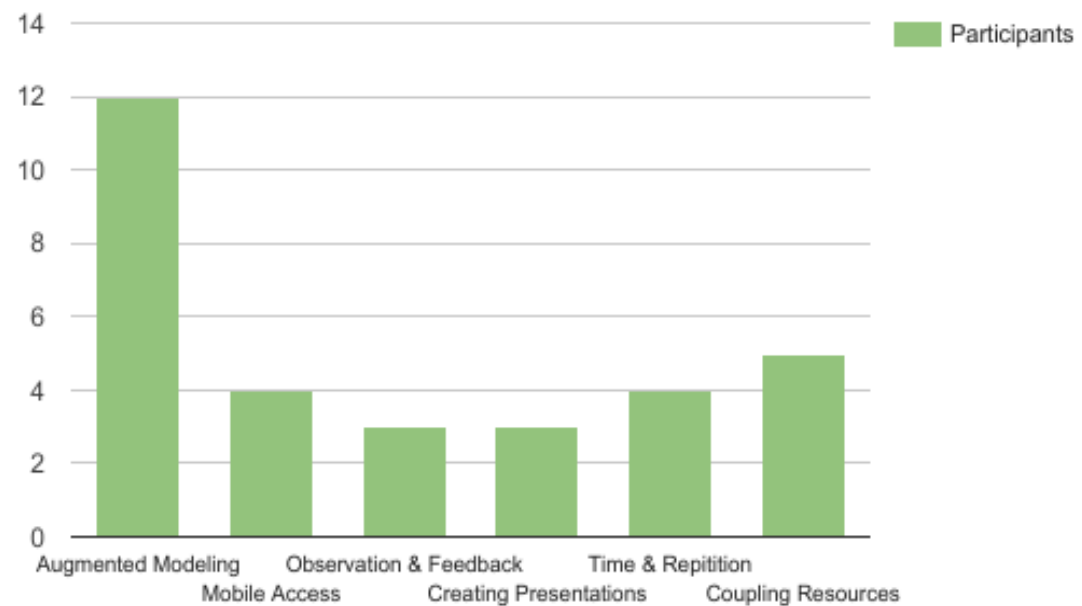
### Gauging Attitudes



## Post Survey

### Gauging Attitudes

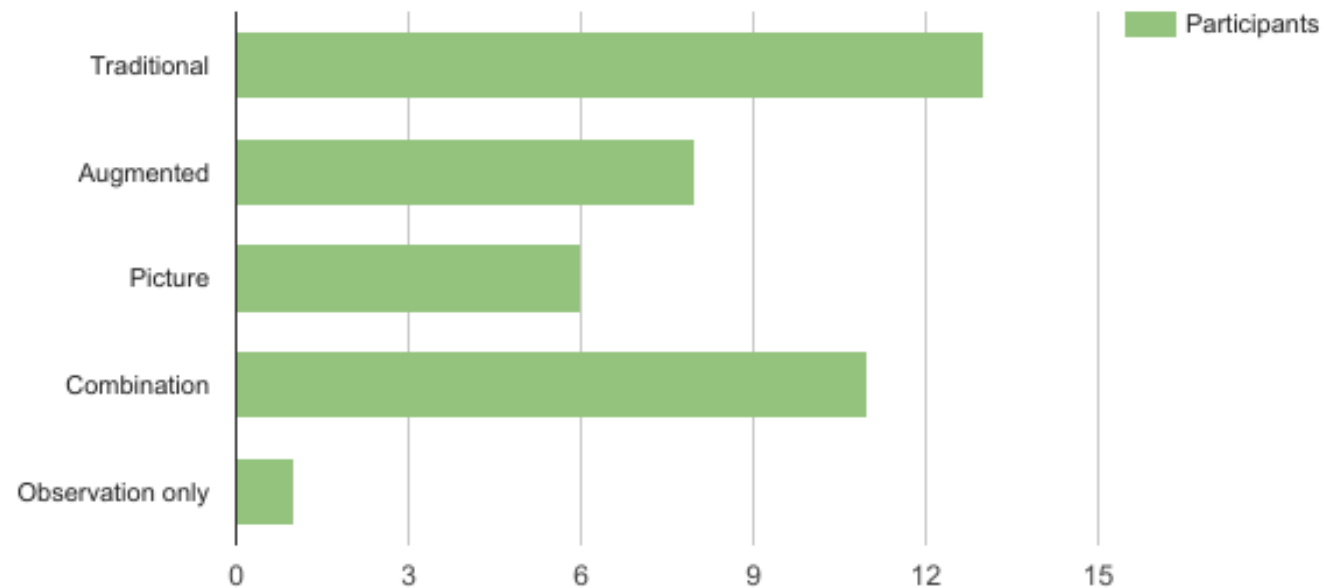
**What do you think was most helpful in leading to perceived improvements?**



## Post Survey

## Gauging Attitudes

**If you had a choice of dissection method which format would you choose again?**



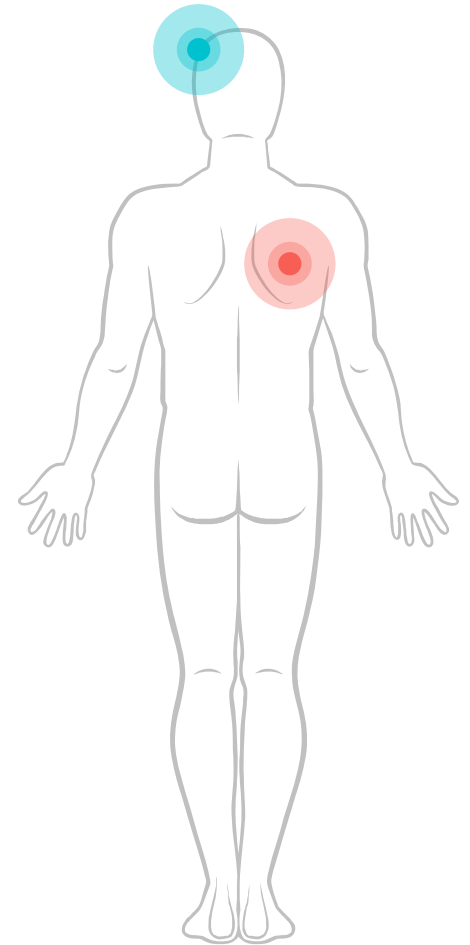
## Insights

### **Learner Efforts**

Students particularly enjoyed the ability to work at their own pace, mobile access, see multiple perspectives, and share their personal findings and obtain feedback.

### **Coupling Resources**

Although Anatomy 4D is a great stand-alone app, its learning power seems better realized by teaming with other learning tools and strategies.



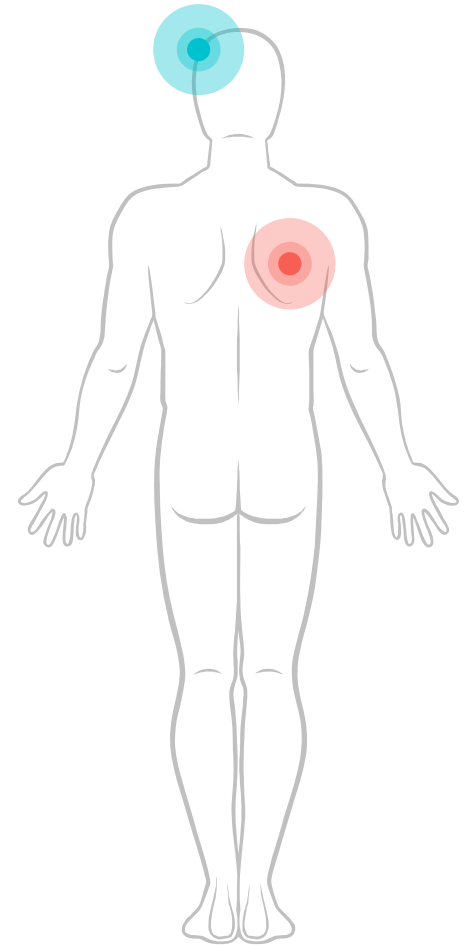
## Improvements

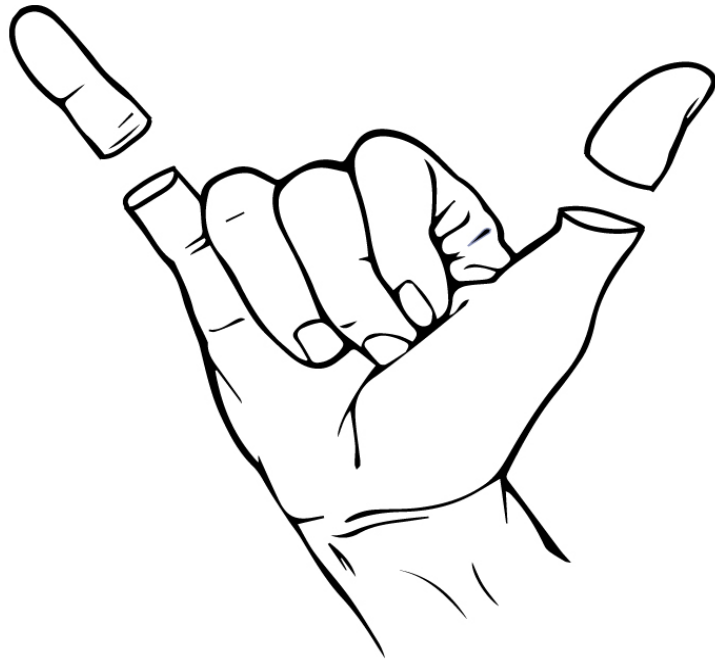
### Delivery

- ▶ Provide specific ID list to students
- ▶ Offer a synchronous session
- ▶ Storify dissection in module

### Assessment

- ▶ More AR focused quiz questions
- ▶ Require cross-reference visuals
- ▶ Install two-day peer feedback period





# THANK YOU!

## Special gratitude

For backing and inspiration to:

- ▶ Critical friends (Erika & Mia-Pia)
- ▶ Dr. Curtis Ho (advisor)
- ▶ LTEC classmates and cohort
- ▶ Entire LTEC 'Ohana

# Questions?

Send me a line:

[joshua.jeong@hawaii.edu](mailto:joshua.jeong@hawaii.edu)