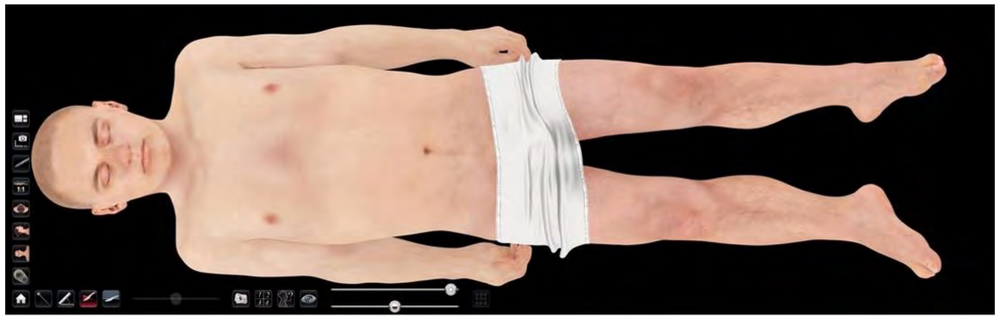
Students-as-Teachers: Integrating Student Designed Curriculum and Novel Technology to Improve Learning Outcomes

By:
Dr. Erica Ausel, Assistant Professor of Anatomy, Marian University, College of Osteopathic Medicine

Acknowledgements:
Thank you to Mona Kheiry for providing the pedagogical training modules for the students who participated in this project. Thank you to Allison Seacat for allowing me to showcase her Master's work in this poster. Finally, thank you to MU-COM for providing the tools to explore this novel teaching method for the benefit of our students.

Purpose and Goal

In December of 2020, Marian University acquired an Anatomage Table, a virtual dissection tool, to supplement biomedical education. This technology offers a broad range of tools including virtual dissection of four once living donors, 3-dimensional (3D) cadaveric prosections, 3D physiological pathways, and thousands of pathological case studies with supplemental medical imaging.



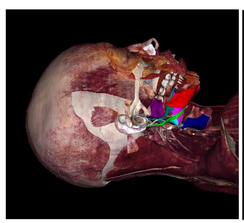
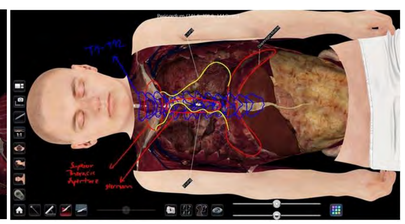
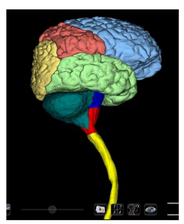
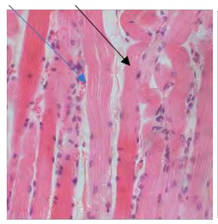
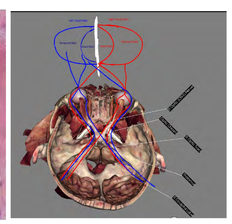
As the course director of Anatomy, Histology, and Embryology I and II (AHE) in the Biomedical Science Master's (BMS) program, my goal was to integrate this expansive tool into the course. With no laboratory component for this course, transferring an understanding of complex, 3D anatomy to the students is a challenge. Therefore, my primary goal for this work was to supplement gross anatomical identification.

Pairing with my venture into the science of teaching and learning, I wanted to measure the impact the Anatomage Table had on students taking the courses, as compared to the 2D images currently in use. To accomplish this goal, I enlisted the help of 11 BMS students who used the Table to complete their Capstone projects. It is my experience with these students-turned-teachers that I address in this poster.

Methods

The student and I worked together to outline project goals and requirements. They were as follows:

1. Explore relevant literature to develop an understanding of successful pedagogical applicable to the project.
2. Design and create an active learning activity on the Anatomage Table for future AHE students using Backwards Design to:
   - Reinforce current lecture material and course learning objectives.
   - Create goals and objectives for the activity prior to its design.
   - Provide direction, via metacognition, for future students.
3. Create a module in Canvas that follows a common structure, providing consistency for future users. Include a module introduction, activity instructions, and a brief assessment to test the outcomes of stated learning objectives. (Images 1-6)
4. Write a manuscript reviewing associated pedagogical methods, outlines the project goals and methods, and reflects on the activity's creation.

Results, Future Directions, and Reflections

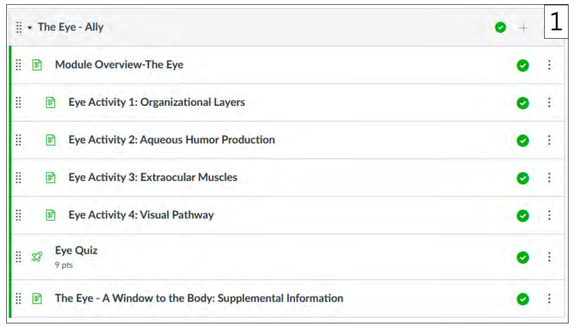
All 11 students completed their respective projects, which are now being integrated into the AHE curriculum. On a voluntary basis, 24 current AHE students complete one activity per-exam block (4 per semester). For this pilot program, our goal is to test the activities before requiring their completion for the course.

Four of the eleven students have continued to work with me on the project. Results thus far have shown that students who participated in the pilot program scored higher on exams overall and on exam questions related to Anatomage activities; significantly so for certain material. In addition, the perception of students regarding the use of this technology in anatomical education has become more positive throughout the semester. We have submitted abstracts to present at one national (American Association of College of Osteopathic Medicine's Educating Leaders 2022 Conference) and one international (International Association of Medical Science Educator's Annual Conference) conference to present the project and the results of the pilot study. After peer review and critiques from these presentations, we plan to submit manuscripts to the journal Medical Science Educator.

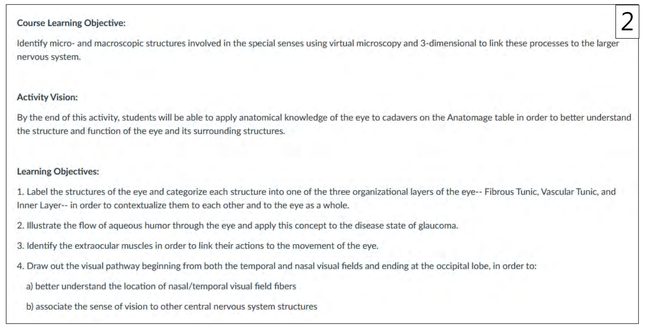
Reflecting on the project as whole, I encountered a few minor challenges primarily related to the level of experience students had with succinct instructions as well as technological glitches. However, it has been a joy to work with these students overall. Their unique perspectives for creating activities that fit the needs of the students have changed the course for the better. I look forward to continuing this work alongside these students-turned-teachers.

Example of Student Designed and Created Anatomage Learning Activity by Allison Seacat

1



2



Course Learning Objective:

Identify micro- and macroscopic structures involved in the special senses using virtual microscopy and 3-dimensional to link these processes to the larger nervous system.

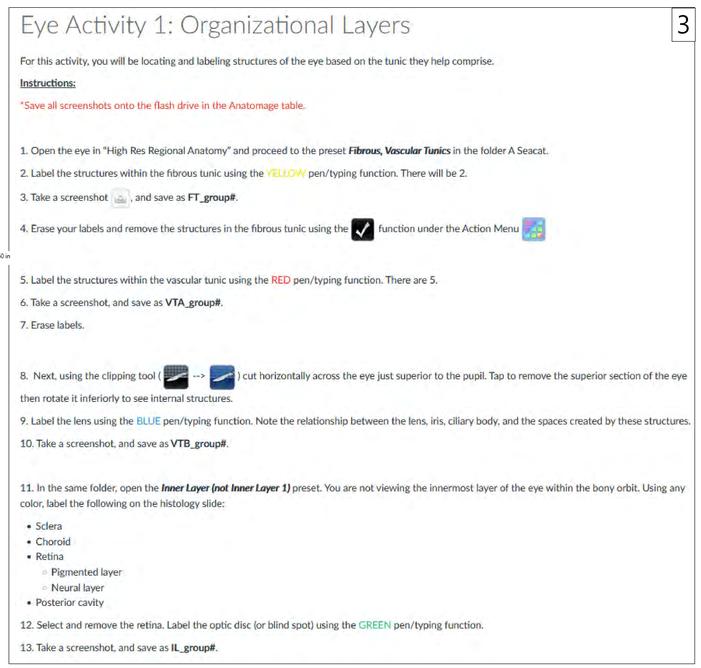
Activity Vision:

By the end of this activity, students will be able to apply anatomical knowledge of the eye to cadavers on the Anatomage table in order to better understand the structure and function of the eye and its surrounding structures.

Learning Objectives:

1. Label the structures of the eye and categorize each structure into one of the three organizational layers of the eye-- Fibrous Tunic, Vascular Tunic, and Inner Layer-- in order to contextualize them to each other and to the eye as a whole.
2. Illustrate the flow of aqueous humor through the eye and apply this concept to the disease state of glaucoma.
3. Identify the extraocular muscles in order to link their actions to the movement of the eye.
4. Draw out the visual pathway beginning from both the temporal and nasal visual fields and ending at the occipital lobe, in order to:
   a) better understand the location of nasal/temporal visual field fibers
   b) associate the sense of vision to other central nervous system structures

3



Eye Activity 1: Organizational Layers

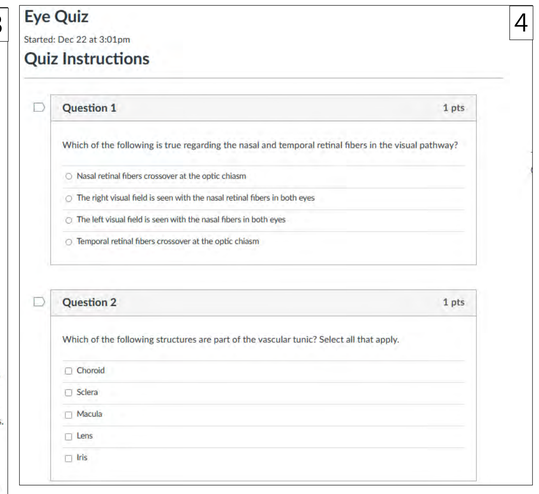
For this activity, you will be locating and labeling structures of the eye based on the tunic they help comprise.

Instructions:

*Save all screenshots onto the flash drive in the Anatomage table.

1. Open the eye in "High Res Regional Anatomy" and proceed to the preset ***Fibrous, Vascular Tunics*** in the folder A Seacat.
2. Label the structures within the fibrous tunic using the YELLOW pen/typing function. There will be 2.
3. Take a screenshot, and save as **FT_group#.**
4. Erase your labels and remove the structures in the fibrous tunic using the function under the Action Menu
5. Label the structures within the vascular tunic using the RED pen/typing function. There are 5.
6. Take a screenshot, and save as **VTA_group#.**
7. Erase labels.
8. Next, using the clipping tool (-->) cut horizontally across the eye just superior to the pupil. Tap to remove the superior section of the eye then rotate it inferiorly to see internal structures.
9. Label the lens using the BLUE pen/typing function. Note the relationship between the lens, iris, ciliary body, and the spaces created by these structures.
10. Take a screenshot, and save as **VTB_group#.**
11. In the same folder, open the ***Inner Layer (not Inner Layer 1)*** preset. You are not viewing the innermost layer of the eye within the bony orbit. Using any color, label the following on the histology slide:
    - Sclera
    - Choroid
    - Retina
      - Pigmented layer
      - Neural layer
    - Posterior cavity
12. Select and remove the retina. Label the optic disc (or blind spot) using the GREEN pen/typing function.
13. Take a screenshot, and save as **IL_group#.**

4



Eye Quiz

Started: Dec 22 at 3:01pm

Quiz Instructions

Question 1 1 pts

Which of the following is true regarding the nasal and temporal retinal fibers in the visual pathway?

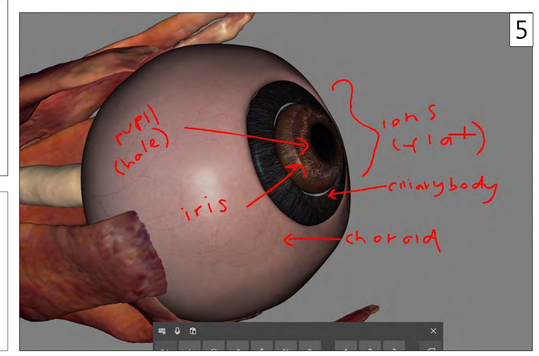
- Nasal retinal fibers crossover at the optic chiasm
- The right visual field is seen with the nasal retinal fibers in both eyes
- The left visual field is seen with the nasal fibers in both eyes
- Temporal retinal fibers crossover at the optic chiasm

Question 2 1 pts

Which of the following structures are part of the vascular tunic? Select all that apply.

- Choroid
- Sclera
- Macula
- Lens
- Iris

5



1: Canvas module built using a common design.
2: Activity overview including learning objectives.
3: Activity instructions.
4: Assessment created to test learning objectives.
5-6: Submission by AHE students during Fall 2021 semester

6