Affordable Learning Georgia Affordable Materials Grants  
Transformation Grants Final Report

# General Information

**Date:** May 14, 2025

**Grant Round:** Round 25

**Grant Number:** 712

**Institution Name(s):** Augusta University

**Project Lead:** Juan Manuel Ramiro Diaz

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**Course Name(s) and Course Numbers:**

Human Anatomy and Physiology II

BIOL 2252

**Semester Project Began:** Spring 2024

**Final Semester of Implementation:** Spring 2025

**Total Number of Students Affected During Project:** 175 students were affected in Spring 2025 following the implementation of the materials created.

# Narrative

**Materials Created:**

Title: *Anatomy and Physiology II: An Interactive Histology Atlas*

Authors: Juan Manuel Ramiro-Diaz; Karen Wiles; Georgios Kallifatidis; Christina Wilson; and Soma Mukhopadhyay

Weblink: <https://pressbooks.pub/aandp2histologyatlas/>

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Human Anatomy and Physiology I & II (BIOL 2251 and 2252) are a two-semester sequence of courses offered by the Department of Biological Sciences at Augusta University and many USG institutions. Students enroll in these rigorous courses to fulfill prerequisites for many health science-focused undergraduate programs (e.g., nursing, dental, radiation therapy, respiratory therapy) and clinical graduate programs (e.g., physician assistant, dental, physical therapy, medical). The authors previously required the following texts, with the course-specific book requirements outlined in the table:

Lecture textbook: Marieb, E. N., & Hoehn, K. (2019). *Human Anatomy & Physiology* (11th ed.). Pearson.

Lab Manual: Marieb, E. N., Smith, L. A. (2019). *Human Anatomy & Physiology Laboratory manual* (12th ed.). Pearson.

This transformation project eliminates the use of the commercially available lab manual (referred to as “publisher book” in all reported data) through the creation of an open-access interactive histology atlas. The laboratory component of both Anatomy and Physiology courses assesses student learning outcomes that focus on the identification of gross and microscopic structures within the context of the major organ systems of the human body. Students utilize commercially available anatomical models in their study of the gross anatomy of organ systems. Student mastery of gross anatomy is sufficiently supported using the anatomical models and the lecture textbook, and the authors did not feel the need to replicate all portions of a traditional lab manual. Instead, the authors chose to focus on tissue histology, the content area that lacked sufficient representation in the lecture textbook, and a selection of the most complicated organs in gross anatomy.

Microscopic organ system anatomy is assessed through the recognition of tissue types and organ-specific histological features using a compound light microscope and commercially available microscope slides. Due to varied sample preparation techniques (e.g., organ sectioning variation or differences in staining protocol), the appearance of representative tissue samples can have subtle or drastic changes in visual appearance between different batches of slides. Historically, students have had decreased success in learning outcomes related to microscopic anatomy, compared to those related to gross anatomy. The faculty hypothesized that this is, in part, impacted by a misalignment of the micrograph images in the lab manual with the appearance of individual student tissue slides. The images in the lab manual and lecture textbook often do not accurately represent the histological patterns seen in the student slides. The ill-matched images cause confusion for students, which unnecessarily impedes student success in mastery of the tissue histology learning objectives.

While the authors believe that students should be introduced to the ideal tissue appearance, the use of a “textbook perfect” image provides students with an unrealistic prototype to use as they study histology on their own slide. As a result, the authors included multiple, high-resolution images of student slides to provide students with realistic, accessible reference images with which to conduct their study. The transformation materials were created using H5P interactive activities, allowing students to slide a vertical bar left to right to either reveal a hand-drawn illustration overlay or hide it to expose the underlying micrograph. Additionally, the authors included model-based illustrations with hidable labels the students can use to practice their identification of gross anatomical structures.

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This open-access textbook utilizes H5P interactive elements to enhance student engagement and maximize student learning. An easy-to-use slide-bar on these H5P interactive activities gives students the ability to reveal or hide labeled illustrations that overlay onto histological micrographs to help students visualize and more easily identify cell- and tissue-, and organ-level structures.

The authors anticipate that student savings will extend beyond the scope of Augusta University. There are two main suppliers of commercially available undergraduate-level histology slides, Carolina Biological Supply Co. and Ward’s Science. All images included in the atlas are tissue slides obtained from these suppliers. The authors predict that many A&P laboratory courses across the USG utilize slides from these same suppliers. It is our hope that other USG A&P faculty will utilize this open-access atlas to further increase student savings across the USG. The authors have emailed the A&P teaching faculty (or department chairs) across all USG institutions to encourage them to share this product with their students.

The authors are most delighted to be able to showcase the immense talent of several undergraduate students in this transformation project. The Medical Illustration Graduate Program within the College of Allied Health Sciences at Augusta University is one of only four such programs in the country. The project included undergraduate students who aspire to careers as medical illustrators as part of the illustration team for this project. The authors were grateful to be able to showcase the impressive illustration talents of three aspiring medical illustrators in their recently published open-access histology atlas: Edna Martinez Sanchez, Zoey Collins, and Karis Le. The works of Zoey Collins and Karis Le were supported through grant 712 funds.

The authors feel strongly that student involvement in the project not only strengthens the pedagogical value of the materials created in this project but also allows faculty to mentor student participants and support their unique academic journeys as they work towards professional goals. The authors felt strongly that this project offered these aspiring medical illustrators the unique opportunity to include their own published works in their creative portfolio as they seek acceptance to a Medical Illustration Graduate Program.

This transformation impacted instruction in significant ways. Prior to the transformation, teaching faculty would spend hours each week drawing histology sketches on the classroom whiteboard for use during lab sessions. This transformation allows all students to have access to the illustrations of the talented faculty and allows the faculty to spend more time helping students in other ways.

An additional accomplishment the authors would like to mention is their collaboration with the following scientific partner:

* **Motic Instruments USA Inc**., which generously permitted the inclusion of Images of the Motic Panthera E2 compound light microscope in the book (https://www.motic.com/)

The authors are proud of the wide reach the Atlas has had in its short time since its publication in January 2025. Since publication (January 4, 2025), our open-access histology atlas has generated 2105 total visitors (5260 total page views).

## Student Quotes

*I liked how they made it easy to identify what the pointer was showing and what was being labeled.*

*I just like the thought that y'all made it free for anyone to use and went through the effort to create it.*

*Good job!*

*I love the atlas, definitely depended on it throughout the semester*

*Having a way to study histology outside the lab was really helpful*

*I liked how the slides perfectly resembled the slides from lab.*

*I really liked the histology atlas! I think it should be more implemented in preparing for the lab practicals and when learning the lab materials because the drawings are easier to understand. The outlining of the histology gives me the ability to be able to apply that on the exam as well. I think you should add a way for students to be able to be even more interactive with the material presented in the books!*

# Quantitative and Qualitative Measures

## Uniform Measurements Questions

**Student Opinion of Materials**

**Was the overall student opinion about the materials used in the course positive, neutral, or negative?**

Total number of students affected in this project: 175 students

* Positive: 90-100 % of 21 respondents
* Neutral: 0-10 % of 21 respondents
* Negative: 0 % of 21 respondents

**NOTE:** Values reported above represent ranges in student opinion responses for nine separate questions.

**Student Learning Outcomes and Grades**

**Was the overall comparative impact on student performance in terms of learning outcomes and grades in the semester(s) of implementation over previous semesters positive, neutral, or negative?**

*Student outcomes should be described in detail in Section 3b.*

Choose One:

* \_\_\_ Positive: Higher performance outcomes measured over previous semester(s)
* \_X\_\_ Neutral: Same performance outcomes over previous semester(s)
* \_\_\_ Negative: Lower performance outcomes over previous semester(s)

**Student Drop/Fail/Withdraw (DFW) Rates**

**Was the overall comparative impact on Drop/Fail/Withdraw (DFW) rates in the semester(s) of implementation over previous semesters positive, neutral, or negative?**

*Depending on what you and your institution can measure, this may also be known as a drop/failure rate or a withdrawal/failure rate.*

18.13 % of students dropped/failed/withdrew from the course in the final semester of implementation.

Choose One:

* \_\_\_ Positive: This is a lower percentage of students with D/F/W than previous semester(s)
* \_\_x\_ Neutral: This is the same percentage of students with D/F/W than previous semester(s)
* \_\_\_ Negative: This is a higher percentage of students with D/F/W than previous semester(s)

**Important Note:** The choice indicated above is based on data that shows a trend towards improved DFW rates (18.13% compared with 23.50%), but which lacks statistical power to make comparisons with data collected prior to implementation.

## Measures Narrative

### Quantitative Data: DFW Rates

Student success metrics (ABC/DFW rates) showed a trend towards increased course retention and completion. A DFW rate of 18.13% was reported using the Interactive Histology Atlas compared with a 23.50% DFW rate using the lab manual commercially available through Pearson. However, the statistical power of this data is insufficient to determine statistical significance. Additional data must be collected in future semesters. One barrier observed in this project is the inability to fully assess the product, given the short time of implementation. Further study is needed to fully assess the impact of the atlas on student success.

### Quantitative Data: Lab Practical Exam Performance

Student exam performance data (% of students answering questions correctly) were collected for several histology questions on Lab Practical Exam 1 (10 questions) and Lab Practical Exam 2 (10 questions) in the BIOL 2252 course (A&P II). Many co-variances impact the ability of the authors to discuss statistical significance. Data collection will continue for several more semesters, and it is the authors' hope that by increasing the number of data samples, the authors will be able to discuss statistical significance. Nevertheless, student lab practical exam performance is indistinguishable between the two student groups (using the textbook publisher lab manual and using their interactive histology atlas). The authors are pleased to report that open-access materials developed in this project (*Anatomy and Physiology II: An Interactive Histology Atlas*) yielded student success comparable to the for-profit publisher materials.

### Qualitative Data: Student Satisfaction Survey

A student satisfaction survey was conducted anonymously in Qualtrics. Students in the Spring 2025 semester were invited to submit feedback on the Interactive Histology Atlas through an anonymous survey. Students were asked to evaluate statements on a Likert scale (strongly disagree, disagree, neutral, agree, strongly agree).

Data from student respondents (21 respondents out of 175 total students) is compiled in the chart below. Negative responses (strongly disagree and disagree) were combined and reported as negative responses. Positive responses (strongly agree and agree) were combined and reported as positive responses. Values reported below represent ranges in student opinion responses for eight separate questions, and are as follows:

* Positive: 90-100 % of 21 respondents
* Neutral: 0-10 % of 21 respondents
* Negative: 0 % of 21 respondents

# Sustainability Plan

The work produced in this project, *Anatomy and Physiology II: An Interactive Histology Atlas,* was created in Pressbooks, a company dedicated to open-access educational materials. Grant funds allowed the authors to purchase two additional years of Pressbooks subscription service, which will allow the team to make continual improvements. Beyond this time, Pressbooks has generously agreed to host our book indefinitely under the condition that it remains OER (currently licensed as CC BY-NC-SA).

Weblink: <https://pressbooks.pub/aandp2histologyatlas/>

# Future Affordable Materials Plans

The authors have no immediate plans to apply for additional transformation grants. However, we are committed to continual improvement of the materials created in this project in direct response to student feedback.

# Future Scholarship Plans

The authors have presented this work at the following conferences:

Open for Student Success: A Georgia State University Library Symposium

45 minutes Workshop Presentation; Title: Developing a Low-Cost, Interactive Histology Atlas for Anatomy and Physiology

March 7, 2025

American Physiological Society Summit

Poster; Title: Development of an Open Access, Interactive Histology Atlas for Undergraduate Anatomy and Physiology

April 25, 2025

Following additional data collection, the authors have plans to publish a manuscript on the educational impact of our two open access histology atlases.