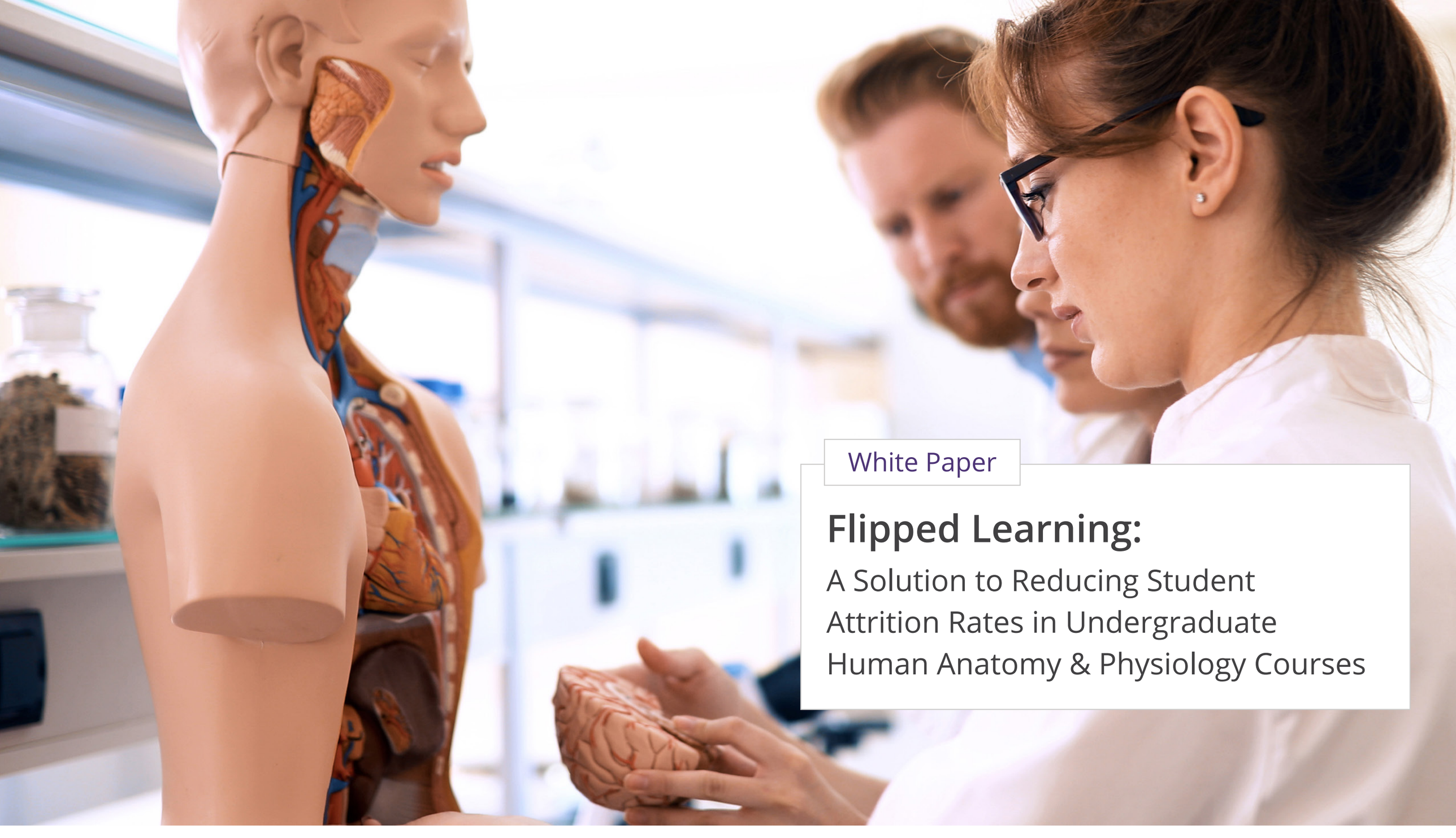


White Paper

Flipped Learning:

A Solution to Reducing Student Attrition Rates in Undergraduate Human Anatomy & Physiology Courses

Anatomage®

Table of Contents

Introduction

Concerns are growing as the attrition rates, characterized by dropout or failure rates, in undergraduate Anatomy & Physiology (A&P) courses have been observed at 30% to 40%.[1] This trend poses challenges for the future pipeline of healthcare professionals.

To further explore the issue, we've uncovered insights that could influence attrition rates and examined how universities globally have adopted innovative pedagogical strategies like flipped learning to enhance learning outcomes in undergraduate Anatomy and Physiology (A&P) courses. This white paper explores how flipped learning can transform the educational experience, boosting student satisfaction, improving learning outcomes, and ultimately helping to bridge the gap in the medical workforce.

Problem Identification

Undergraduate Anatomy and Physiology (A&P) courses provide an essential foundation for those looking to advance their education and careers in healthcare. Failure to pass A&P can significantly delay students' academic and professional progress. The course is known for its high failure rates, between 30% to 50%,[2] and is often seen by students as daunting and unengaging. Terms like "intimidating," "challenging," and "conceptually demanding"[3] were used by the students to describe the difficulties encountered in dealing with the complexity of A&P courses.

Findings

From our research, we've observed the following key factors potentially influencing the dropout rates in undergraduate Anatomy and Physiology courses:

- **Failing Grades:** Course failures significantly impact attrition rates, with research showing that 43.6% of students either fail or withdraw from Anatomy and Physiology I on their first try,[4] there is a need to address student performance.
- **Motivation:** A lack of intrinsic motivation impacts learning outcomes, with over half of the students (52.7% expressing disinterest or neutrality towards the course.[5] Research also suggests a positive correlation between student motivation and withdrawal rates in Human Anatomy and Physiology courses.[5]
- **Career Relevance:** The perceived irrelevance of the course to future careers also contributes to attrition rates. Only 40.5% of nursing students believed the course prepared them for their chosen career path.[6]

Quick Stats

43.6%

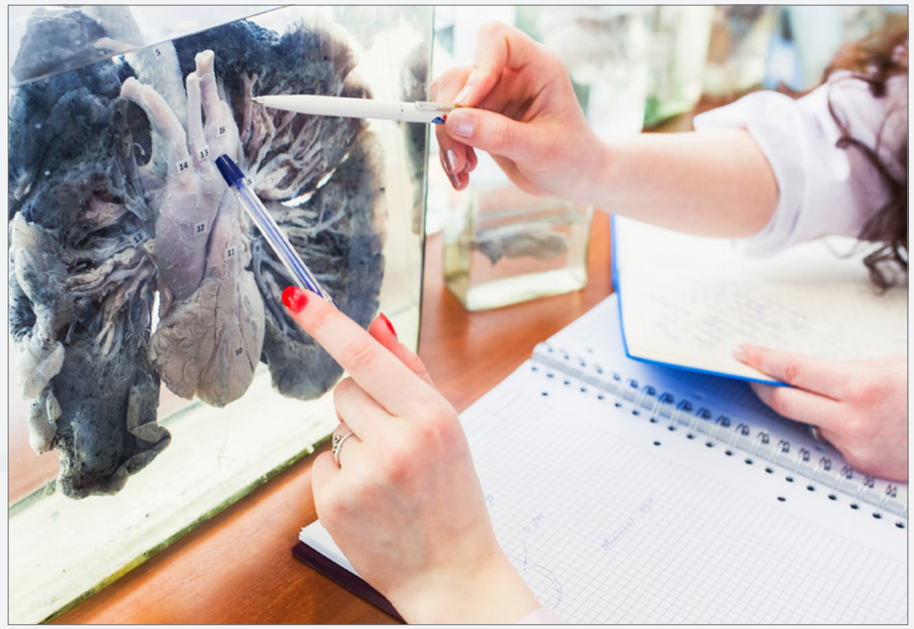
of first-time students fail or leave Anatomy and Physiology I[4]

52.7%

showed disinterest or were neutral towards the course[5]

59.5%

of nursing students did not believe the course adequately prepared them for their future careers[6]



Understanding the Three Phases of Student Dropout Rates in Undergraduate Anatomy and Physiology Courses

Identifying early indicators of potential dropout requires a mindful approach toward students. It is common for students to show signs of disengagement prior to experiencing academic difficulties. Below are the three stages of student disengagement in undergraduate Anatomy and Physiology courses.

Stage 1: Becoming disengaged in classes

Disengagement among undergraduate Anatomy and Physiology students is often linked to a lack of motivation. Research from an Australian University indicates that 37% of Bachelor of Nursing students acknowledge that their disengagement in undergraduate A&P courses stems from low motivation.[7]

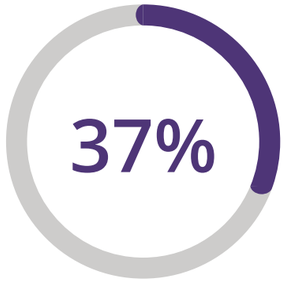
Stage 2: Performing poorly in tests

Lower academic performance is a significant indicator of the risk of student dropout. Studies suggest that up to 50% of students in Anatomy and Physiology (A&P) courses might not reach the minimum grade of C.[2] This situation often results in students having to retake the course, consider changing their major, or leave their studies.

Stage 3: Withdrawing from the course

Struggling in Anatomy & Physiology (A&P) is a significant reason why undergraduates change their majors or, in more severe cases, leave college altogether. A study at Jamestown Community College found that the college dropout rate for students withdrawing from undergraduate A&P courses ranged from 37% to 68%.[8]

Quick Stats



of students attribute their disengagement in undergraduate A&P courses to low motivation[7]

50%

of A&P students may not earn at least a C grade[2]

% of students dropping out of undergraduate A&P courses might leave the college[8]

Solutions

Based on the insights above, we've recognized the impact of learning attitudes and outcomes on undergraduate A&P dropout rates. Addressing increasing dropout rates demands innovative teaching strategies that resonate with digital natives' behaviors. And technology emerges as a pivotal tool in this context.

This section explores the benefits of flipped learning, showcasing how educational institutions around the world are implementing it to boost student engagement and learning outcomes.

Introduction to Flipped Learning

Undergraduate Anatomy and Physiology courses present a challenging curriculum, requiring extensive memorization alongside intensive hands-on dissection practice. Its primary objective is to establish a solid foundation for students, facilitating their progression in subsequent medical education and training. Given these demands, flipped learning emerges as an optimal approach, leveraging its capacity to enrich hands-on practical sessions. Designed to enhance student engagement, flipped learning enables students to learn theories through digital lectures at home and allows for more interactive time with teachers and peers during in-person sessions.

The following table delineates the variances between traditional and flipped classrooms:

	Traditional Classroom	Flipped Classroom
Before Class	Students read materials in textbooks and prepare notes for in-person sessions.	Students watch digital learning materials, including video lectures and visual lessons, and prepare notes for in-class discussion.
During Class	Students listen to lectures; teachers may not have time to answer questions.	Students have face-to-face interactions with peers and teachers to discuss materials covered in digital lectures. They participate in discussions, lab activities, and hands-on learning.
After Class	Students work independently on homework.	Students continue reviewing digital materials to reinforce key concepts and review feedback provided by teachers during in-class lessons.

Flipped Learning Benefits

Fosters a positive learning mindset among A&P and undergraduate medical students

Improves learning outcomes

Contributes to reducing dropout rates

Fostering a Positive Learning Mindset Among Undergraduate A&P Students

The advantages of the flipped classroom model primarily stem from its ability to boost student engagement through active learning. With the opportunity to review digital lectures at their own pace, students are encouraged to spend time discussing with teachers to reinforce their learnings during class sessions. This proactive learning approach not only promotes extensive understanding but also shapes a more positive learning attitude, ultimately enhancing learning outcomes.

Real-world Data

LaGuardia Community College conducted research to see how combining flipped learning with active learning techniques affects students' attitudes in Human Anatomy and Physiology classes.[1] They divided the students into a control group, who received traditional lectures with little discussion, and a treated group, which benefited from active learning with more opportunities for discussion.

	Flipped Classroom
Before Class	Students from both groups received early access to the complete suite of course materials via a learning app, one week before the start of the in-person sessions.
During Class	In the in-person session, the control group had limited discussion, whereas the treated group enjoyed extensive interaction. They were urged to participate in group activities aimed at sparking discussions and hands-on exploration of key concepts.
After Class	At the conclusion of the in-person session, students from both groups were requested to summarize their learning achievements.

Result

From this study, the following observations were made:

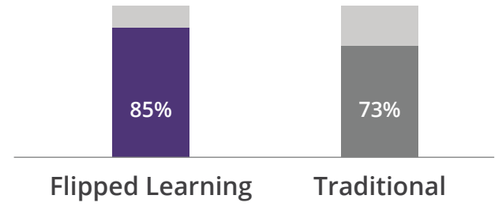
of students in the treatment group agreed on the approach's effectiveness in learning, boosting interest, and improving scores

53%

of surveyed students expressed an increased appeal for the course upon learning about the flipped approach

Retention Rates

Course satisfaction in the treatment group led to better retention rates



Increasing Learning Outcomes Through Flipped Learning

Flipped learning enhances educational outcomes by facilitating increased classroom participation. This approach allows students to learn from each other, amplifying their overall learning achievements. Improved positive learning outcomes will boost student confidence, potentially decreasing dropout rates.

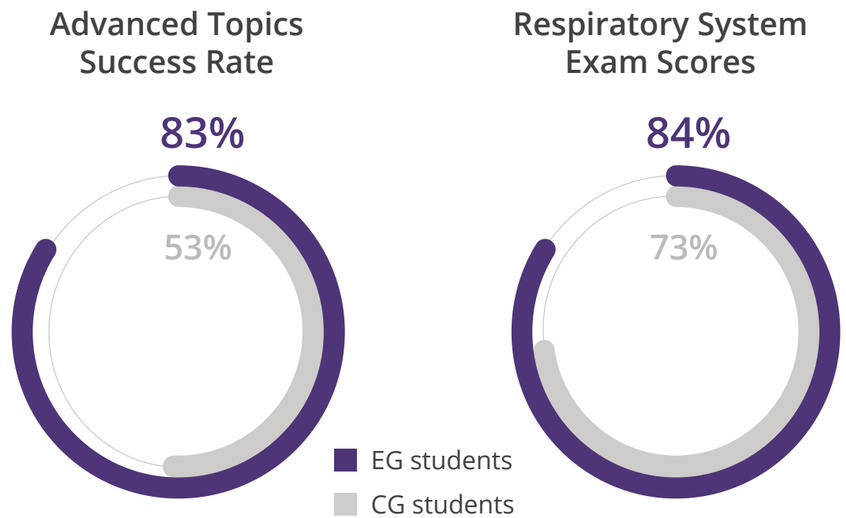
Real-world Data

The College of Nursing at Sultan Qaboos University, Oman, explored the effects of flipped learning on first-year nursing students' Anatomy and Physiology education.[9] The research involved 112 students in an experimental group (EG) who received flipped learning and 59 students in a control group (CG) who experienced a traditional learning approach. The structure of the flipped learning method was designed to enhance student engagement and understanding before, during, and after classes.

	Flipped Classroom
Before Class	Engage with concise, captioned video lectures under 10 minutes each week before attending in-person classes. Topics include the anatomy of the nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles, lungs, and the physiology of breathing. Complete quizzes following each video to reinforce learning and assess understanding.
During Class	At the beginning of the class, students completed a quiz to assess their initial understanding of the material. Subsequently, students were grouped to analyze case studies and work through exercises collaboratively.
After Class	Following the session, students were required to complete additional quizzes. Afterward, they were requested to complete a survey.

Results

The study showed that flipped learning students scored higher than those in traditional settings.



47%

of students reported increased satisfaction with the Anatomy and Physiology course

Preparing Students Better for Healthcare Careers

Pursuing a healthcare career demands more than medical knowledge or technical expertise. Treating patients requires diverse skills for optimal outcomes, including self-leadership, problem-solving, and the ability to develop constructive thoughts. Research indicates that flipped learning fosters and enhances these skills more effectively than traditional teaching methods. By enhancing these skills, students will gain confidence and are more likely to feel better equipped to pursue further education and careers in healthcare.

Real-world Data

conducted a study to examine the impact of the flipped learning approach on developing professional competencies, such as leadership and problem-solving abilities, in nursing students.[10] The study involved 229 nursing students in an anatomy class, with 154 participating in the flipped learning approach and 75 in a traditional learning setting. The experiment lasted 15 weeks. Students in both groups took a pre-test before and a post-test after the experiment.

	Flipped Classroom
Before Class	Students were required to attend an orientation session in person. Students were expected to view online lectures prior to class, revisiting the material as often as necessary.
During Class	Students participated in in-person sessions that involved discussion, practicals, and problem-solving exercises.
After Class	Students were assessed on their leadership skills, problem-solving capabilities, and ability to think constructively.

Results

This study led both universities to make the following observations:

Self-leadership

3.67

Self-leadership score for students in the flipped learning group compared to those in the traditional learning group (3.49)

Problem-solving Abilities

3.63

Problem-solving abilities score for flipped learning students versus the traditional group (3.53)

Constructive Thinking

3.64

Development of constructive thinking score for flipped learning group compared to the traditional group (3.50)

Conclusion

Flipped learning stands as an effective pedagogical approach with significant potential to mitigate attrition rates in undergraduate Anatomy and Physiology classes. Our examination of the research outlined in this white paper reveals that implementing the flipped classroom methodology has not only enabled a more favorable learning disposition but has also generated notable enhancements in academic performance and reinforced students' confidence in their pursuit of higher education and careers in healthcare. By fostering a positive learning attitude, students will enhance their learning outcomes, inspiring them to remain committed to their career paths.

Designing a Flipped Classroom with Anatomage Lessons

Anatomage Lessons is a web-based learning platform that offers digital access to real human cadavers, alongside 41 high-quality, interactive video lessons covering accredited topics in Anatomy and Physiology. The platform is designed to facilitate flipped classroom learning, providing a variety of high-tech materials that can be instantly integrated into existing curricula to enhance student engagement and improve learning outcomes. Tailored for both online and in-class instruction, the platform incorporates action-driven technology that empowers students to take control of their learning journey and support self-evaluation.

An easy way to flip the classroom

- Instant access to real human cadavers for anytime, anywhere study.
- 41 accredited A&P video lessons for seamless flipped learning.
- Includes quizzing and attendance tools for easy class monitoring.

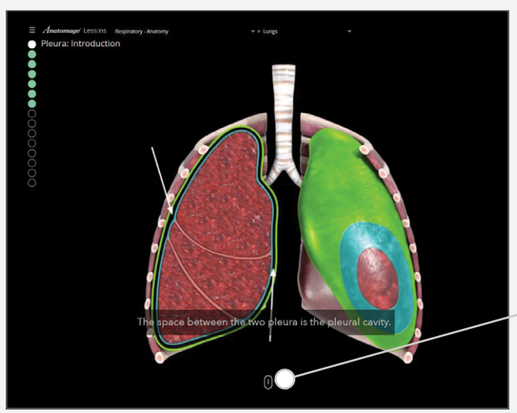
No more dull lectures

- Features real human anatomy materials for accurate, high-quality learning.
- Engaging visuals captivate students, enhancing participation.
- CT Viewer activities provide students with a practical introduction to real-world experiences.

Students own their journey

- Active Drive scrolling allows students to pace their own chapter progression.
- Enables self-assessment for personal understanding checks.
- Interactive tools for exploring real human cadavers, including zoom, rotate, and dissection capabilities.

Discover the Anatomage Lessons platform for yourself.
Visit our website to start your free trial today.



References

1. Entezari, M., Javdan, M. (2016). Active Learning and Flipped Classroom, Hand-in-Hand approach to improve students learning in human anatomy and physiology. International Journal of Higher Education, 5(4). https://doi.org/10.5430/ijhe.v5n4p222

2. Sturges, D., Maurer, T. (2013). Allied Health Students' Perception of Class Difficulty: The Case of Undergraduate Human Anatomy and Physiology Classes. The Internet Journal of Allied Health Sciences and Practice. https://nsuworks.nova.edu/cgi/viewcontent.cgi?article=1460&context=ijahsp

3. Lunsford, E., & Diviney, M. (n.d.). Changing perspectives on anatomy & Physiology: From killer class to gateway course. https://eric.ed.gov/?id=EJ1258124

4. Determinants of student success in Anatomy and Physiology: Do prerequisite courses matter? (n.d.). LifeSciTRC.org. https://www.lifescitrc.org/resource.cfm?submissionID=11656

5. Whitehead, M. C., & Britson, C. A. (n.d.). Assessment of Motivation in Human Anatomy and Physiology Students. https://eric.ed.gov/?id=EJ1377347

6. Horiuchi-Hirose M, Fukuoka T, Saeki Y. (2017) Integration of anatomy and physiology into nursing practice as perceived by undergraduate students and registered nurses: a scoping review. BMC Nurs. 2023 Aug 17;22(1):270. doi: 10.1186/s12912-023-01436-0. PMID: 37587455; PMCID: PMC10433554. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10433554/

7. Todorovic, M., Johnston, A. N., Bentley, S., Williams-Pritchard, G., & Barton, M. (2021). Factors that influence perceived disengagement in anatomy and physiology within undergraduate nursing. Journal of Nursing Education and Practice, 12(2), 50. https://doi.org/10.5430/jnep.v12n2p50

8. Russell, Barbara & Young, Kaye & Lehning, Ellen. (2016). Distribution of and Factors Associated with Anatomy and Physiology I Grades at a Community College. HAPS Educator. 20. 7-21. 10.21692/haps.2016.027. https://egrove.olemiss.edu/cgi/viewcontent.cgi?article=3657&context=hon_thesis

9. Joseph, Mickaël & Roach, Erna & Natarajan, Jansirani & Karkada, Suja & Rose, Arcalyd & Ramos-Cayaban, Arcalyd Rose. (2021). Flipped classroom improves Omani nursing students performance and satisfaction in anatomy and physiology. BMC Nursing. 20. 10.1186/s12912-020-00515-w. https://www.researchgate.net/publication/348161283_Flipped_classroom_improves_Omani_nursing_students_performance_and_satisfaction_in_anatomy_and_physiology

10. Hwang, Y. H., & Oh, J. (2021). The effects of flipped learning approaches in anatomy class. Sustainability, 13(24), 13724. https://doi.org/10.3390/su132413724